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ETHNOBOTANICAL STUDY OF TRADITIONAL MEDICINAL PLANTS IN DEBARK DISTRICT, NORTH GONDAR, ETHIOPIA

By

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LIST OF ACRONYMS

DDARDO	Debark District Agricultural and Rural Development Office
DDEO	Debark District Education Office
DDHO	Debark District Health Office
IBCR	Institute of Biodiversity Conservation and Research
IK	Indigenous knowledge
NMSA	National Meteorological Service Agency

WHOWorld Health Organization

ABSTRACT

Ethnobotany is the study of the relationships between plants and people with particular emphasis on traditional cultures. An Ethnobotanical study on the medicinal plant was carried out in Debark District which is found in North Gondar Zone of the Amhara National Regional State which is about 860Km away from north of Addis Ababa, Ethiopia. The objective of the study was to compile and document medicinally important plants in the District. The study was conducted from October to May 2017. A total of 62 informants (45 males and 17 females) between the ages of 22 and 70 were selected from ten sampled kebeles with purposive (key informants) and random sampling (general informants) techniques. Data were collected using semi-structured interviews, field observations, group discussions and market surveys. Data were analyzed with descriptive statistics and detailed ethnobotanical analytical tools including preference ranking, paired comparison,direct matrix ranking, informant consensus factor (ICF) Fidelity level and Jaccard's Coefficient of Similarity (JCS). A total of 93 plant species, wich 60 species from the wild vegetation, 27 species from home gardens and 6 from both habitat that distributed in 86 genera and 51 families were collected and identified from the study area. From these, 50 species were recorded for the treatment of human health problems, 3 species for livestock and 40 species for the treatment of both human and livestock diseases. Herbs were found the highest plant life forms. The most frequently used plant parts were leaves (33.33%) followed by roots (15.48%). The most widely used method of preparation was crushing (20%) followed by pounding and mixing (18.4 %). Oral use was the commonest (56.67. %) administration route followed by dermal use (29.63%).The most commonly used application of medicinal plant was drinking (37.57%) followed by creaming (16.76 %).Agricultural expansion, firewood collection, construction, timber, forage and charcoal were reported as major threats to plants of the study area. In order to protect medicinal plants destruction and loss of indigenous knowledge, local communities could be involved in conservation and management of plant resources and their indigenous knowledge.

Keywords/phrases: Conservation,fidelity level, Indigenous knowledge,Informant consensus, traditional healers

1. INTRODUCTION

Ethnobotany is the study of the relationships between plants and people with particular emphasis on traditional cultures (Balick and Cox, 1996). Ethnobotany is also defined as local people's interaction with their natural environment: how they classify, manage and use plants available around them (Martin, 1995). The traditional use of medicinal plants dates back to the beginning of human civilization and they are integralpart of culture of many indigenous communities in Asian and African countries (Subramanyam *et al*., 2008; BekaloTesfaye *et al*., 2009).

In Ethiopia, utilization of medicinal plant remedies plays a significant role in preventing or curing various ailments in most parts of the country (Birhan Wubet *et al*., 2011; Mirutse Giday and Tilahun Teklehaymanot, 2013; Tolossa Ketema *et al*., 2013). Particularly, traditional herbal healing systems are widely practiced throughout the rural population as their primary healthcare system (Yineger Haile, 2007; Seid Mohammed and Tsegay Berhanu, 2011). Cunningham *et al*. (2001) explained that the existence of diverse languages, cultures, beliefs and significant geographical diversity favored the formation ofindeginous knowledge on medicinal plants. Hence, there is enormous indigenous knowledge and associated medicinal plant species in Ethiopia (Tinsae Bahru *et al*., 2012). It has been estimated that traditional remedies are the most important and sometimes the only source of therapeutics for nearly 80% of the worldwide population, of which95% of traditional medicinal preparations are of plant origin (Hamilton, 2003). Much of the knowledge on traditional medicine is available in rural communities and perpetuated by word of mouth within family or small community. However, since cultural systems are highly dynamic, these skills are likely to be lost when the communities migrate to towns or regions, or if the local ecology is significantly changed (Sultan Suleiman and Tamirat Alemu, 2012).

However, the high population pressure and its related consequences like increased need for agricultural land, settlement, fuel wood, house construction and income generation have led to an extreme reduction of medicinal plant in all over their ranges (BekaloTesfaye *et al*., 2009; Belayneh Anteneh *et al*., 2012).According to Ermias Lulekal *et al*. (2008), the current loss of medicinal plants in the country due to natural and anthropogenic factors links with the missing of valuable indigenous knowledge associated with the plants. This strong link suggests a need

toconduct ethnobotanical research to document the medicinal plants and theassociated indigenous knowledge and to identify threatened plants to take appropriate conservation measures. Therefore, the present research was conducted to document the wealth of indigenous knowledge on utilization, management and conservation of medicinal plants as well as threats to the plants in Debark District.

2. LITERATURE REVIEW

2.1. Concept of traditional medicines

Traditional medicine has been defined by the World Health Organization (WHO, 1978) as "the sum total of all the knowledge and practices, whether explicable or not, used in diagnosis, prevention and elimination of physical, mental or social imbalance and relying exclusively on practical experience and observation handed down from generation to generation, whether verbally or in written forms''. According to medicinal history, Hippocrates (469-370 B.C) was the first Greek to regard traditional medicine as a science and he is now referred to as the father of medicine.

The use of plants as medicine pre-dates written human history. Many of the herbs and spices used by humans to season food also yield useful medicinal compounds (Lai *et al*., 2004). The use of herbs and spices in cuisine developed in part as a response to the threat of food-borne pathogens. Studies show that in tropical climates where pathogens are the most abundant, recipes are the most highly spiced (Billing *et al*., 1998). Further, the spices with the most potent antimicrobial activity tend to be selected.

In all cultures, vegetables are spiced less than meat, presumably because they are more resistant to spoilage (Sherman and Hash, 2001). Angiosperms (flowering plants) were the original source of most plant medicines. Many of the common weeds that populate human settlements, such as nettle, dandelion, and chickweed, have medicinal properties (Stepp, 2004). A large amount of archaeological evidence exists which indicates that humans were using medicinal plants during the Paleolithic, approximately 60,000 years ago.

Furthermore, animals such as non-human primates, monarch butterflies and sheep are also known to ingest medicinal plants to treat illness (Sumner,2000).Plant samples gathered from prehistoric burial sites are an example of the evidence supporting the claim that Paleolithic peoples had knowledge of herbal medicine.

2.2. Medicinal plants and ethnomedicine in the World

WHO tried to seek the traditional medicinal plant's constituents those were used for medicinal plants (purpose) on different parts of the world. For example in China and India practitioners were named as herbalists bone settlers, spiritual healers, traditional psychiatrists (WHO, 1978).

2.2.1. Traditional medicinal activities in Ethiopia

In Ethiopia, there is a great geographical diversity which creates tropical, subtropical and temperate climaticcondition resulted in great diversity in flora and fauna in Ethiopia. This conciliation also favored the evolution of diverse disease and their causative agents. In response to this disease, Ethiopians have developed remedies that restore and enhance good health. The knowledge is based on oral traditional or information codified in early medico-religious manuscripts (Mesfin Tadesse and Sebsebe Demissew, 1992).

2.3. Habit and structure of plants used for preparation of traditional medicine

Traditional medicinal plants, used for medicinal purposes, may have one of the following habits: herbaceous, shrubby or shrub trees, climber or any other. The traditional medicinal constituents or ingredients may be found in their leaves, seeds, flower, fruit, root, rhizomes, stems, bark, and seed-coat and so on. To get maximum benefit or medicine, there is specific season and time of the day in which active principle of plant materials would be attainable (Bannerman, 1993).

2.4. Plants in ethnoveterinary medicine

An ethnoveterinary medicine which refers to traditional animal health care knowledge and practices comprising of traditional surgical and manipulative techniques, traditional immunization, magic-religious practices and beliefs, management practices and the use of herbal remedies to prevent and treat a range of disease problems encountered by livestock holders (Tafesse Mesfine and Mekonnen Lemma, 2001). Stock raisers, both farmers, and herders have developed their own ways of keeping their animal health and productivity. They treat and prevent live stocks disease using sometimes age old homemade remedies, surgical and manipulative techniques. These indigenous local animal health care beliefs and health care

practices constitute an ethnoveterinary medicine. In spite of its permanent importance as livestock health care system, the various traditional veterinary practices remained undocumented in Africa and Ethiopia (Dawit Abebe and Ahadu Ayehu, 1993). Thus, the creation of awareness on ethnoveterinary medicine emphasizing on useful plants used for the treatment of livestock has paramount importance to livestock management. In addition, proper documentation and understanding of farmer's knowledge, attitude, and practices about the occurrence, cause, treatments, prevention and control of various ailments is important in designing and implementing successful livestock production (Tafesse Mesfin and Mekonen Lemma, 2001).

2.5. Threats to medicinal plants and the associated knowledge

There are two sources of threats to medicinal plants specifically and in general to the biodiversity i.e. natural and man-made threats. Man made threats include; agricultural expansion, destructive harvesting, and introduction of invasive species, urbanization,population pressure and over harvesting are some of the man made threats to medicinal plants. Natural threats include-recurrent drought, bushfire, disease and pest outbreak (William, 2003) and so on.

2.6. Conservation efforts of medicinal plants

The conservation of medicinal plants is achieved through *in-situ* and *ex-situ*conservation methods (Cunningham, 1996). *In-situ* is a type of conservation where species are conserved in their natural habitats which include the national park and reservoirs. This method is especially preferable for those species where domestication and management is difficult out of their natural and normal habitats and ecosystem (Zemede Asfaw, 2001). *Ex-situ* conservation is another method of conservation where endangered species are protected by removing part of them from a threatened habitat and place them in a new location which may be a wild area or within the care of humans which includes seed genebanks, field gene banks, arboreta, botanic gardens. *In-situ*and *ex-situ* should be complementarily implanted in Ethiopia to conserve valuable plant species which are threatened due to natural or manmade factors (Abebe Demissie, 2001).

2.7. Advantages of traditional medicinal plants

Plants in general and medicinal plants, in particular, are invaluable, fundamental and most useful to almost all life on the earth, one of the most significant uses of the plant is the phytomedicinal role, i.e., the benefits of medicinal plants. Medicinal plants play a typical role in the lives of many people in terms of health support, financial income and lively hood security (Hamilton, 2003; Abdulhamid Bedri *et al*., 2004; Hamilton, 2004). Plants have been indispensable and the most important sources of both preventive and curative traditional preparation for human beings and livestock since time immemorial. In addition to their medicinal value, plants have innumerable uses to humans and animals welfare. All these uses of plants are directly or indirectly linked with health care (Hamilton, 2004; Kelbessa Urga *et al*., 2004). Therefore, health care and botany have evolved as the inseparable domain of human activities since various plant products are of paramount importance in traditional health care systems.

2.8. Disadvantages of traditional medicinal plants

Each and every type of medicine, whether it is traditional or modern has its own useful aspects and harmful aspects. In preparing traditional medicine from the traditional medicinal plant, crafts and the traditional medicinal practitioners are not hygienic. In addition, the imprecise diagnosis, the use of several types of medicinal plants species in combination (without scientific proof) could result in health damage is also other negative side of the traditional medicine. Lack of precise dosage which could lead to toxicity is also the other disadvantage of traditional medicine.

3. STATEMENT OF THE PROBLEMS

In developing countries like Ethiopia, the indigenous knowledge about traditional medicinal plants is transferred secretly from generation to generation orally. Due to this, there is a gap in the documentation of medicinal plants by the community in the country. In addition, the indigenous knowledge on the usage of medicinal plants are also getting lost because of migration from rural to urban areas, industrialization, expansion of modern education and specialized healers do not convey their knowledge to next generation. Also in most parts of the country, the wild plants and forests are almost totally lost by a humanimpact like deforestation, agricultural expansion, over-exploitation and population growth and hence there is an evident loss of biodiversity (Gurmessa Fikadu, 2015). These problems are evidently observed in Amhararegional state of Ethiopia, by which Debark district is part of it.

Debark has a suffered plant habitat due to agricultural expansion, firewood collection, overgrazing,construction, timber, forage, charcoal, over usage of medicinal plants and expansion of other infrastructures in the area. This causes the disappearance of medicinal plants and associated indigenous knowledge in the area. Hence, this study on medicinal plants and associated knowledge is fundamental because of no much scientific information about medicinal plants in Debark District. Therefore, this study was conducted to study the diversity and conservation status of traditional medicinal plants in Debark District to recommend appropriate conservation measures.

4. RESEARCH QUESTIONS

This study was intended to answer the following main research questions:

- Which plants species were important as traditional medicine by indigenous peoples of the study area?
- What types of diseases are treated by these plant species? Are they used for treating humans, animals or both?
- What is the current conservation status of the traditional medicinal plants?
- What do the habitats and habit distribution of these medicinal plant species look like?
- How do the local people manage and conserve these medicinal plants species through the traditional practices?
- Are there problems in the transfer of indigenous knowledge from generation to generation? If exist, what are they?

5. OBJECTIVES OF THE STUDY

5.1. General Objective

To identify and document medicinal plants and associated indigenous knowledge as well as their management and conservation status in Debark District.

5.2. Specific Objectives

- To collect and document useful plants as traditional medicine and associated indigenous knowledge in the District.
- To distinguish the plant parts used in the study area.
- To distinguish the methods of preparations of medicinal plants in the study area.
- To distinguish the conservation methods of traditional medicinal plants in the study area.
- To identify indigenous knowledge transfer systems on the traditional medicinal plants.
- To identify the major threats to medicinal plants.

6. MATERIALS AND METHODS

6.1. Description of the study area

6.1.1. Geographical Location, Topography and Climate

The study was carried out in Amhara Region, Northern Ethiopia, North Gondar Zone in Debark District. Debark District is situated at 13° 08' N to 13° 13' N and 37° 53' E to 37° 90' E at an elevation of 1000-4200 m a. s. l. The capital city of the District is also called Debark which is located at about 860 Km north of Addis Ababa, and 130 km from Gondar town (Zonal capital city) along the Gondar–Shire highway. The total area of the District is 282, 105 hectares (282.105 km^2) and comprises 33 kebeles, 30 rural and 3 urban(in Debark town).The District is bordered on the South by Dabat, on the West byTegede, on the Northwest by Tigray Region, on the North by Addi Arkay and on the East by Jan Amora.The district is crossed by the Limalimo Mountains, which form the western end of the Semien Mountains National park.Topographically the district is 20% valley, 60% flat and 20% mountain.

Agroecologically, Debark district is classified into 15% lowland (kolla), 43% middle land (weina wega), 34 % highland (dega) and 8% moist highland (wurch).

Based on 1993- 2016 climate data, the mean annual temperature of the study area was 14.1 ^oC ranging from a mean minimum 6.3 ^oC to mean maximum of 23.1^oC. On the other hand, the study area has a unimodal rainfall pattern with mean annual of 1084 mm (Fig 2).

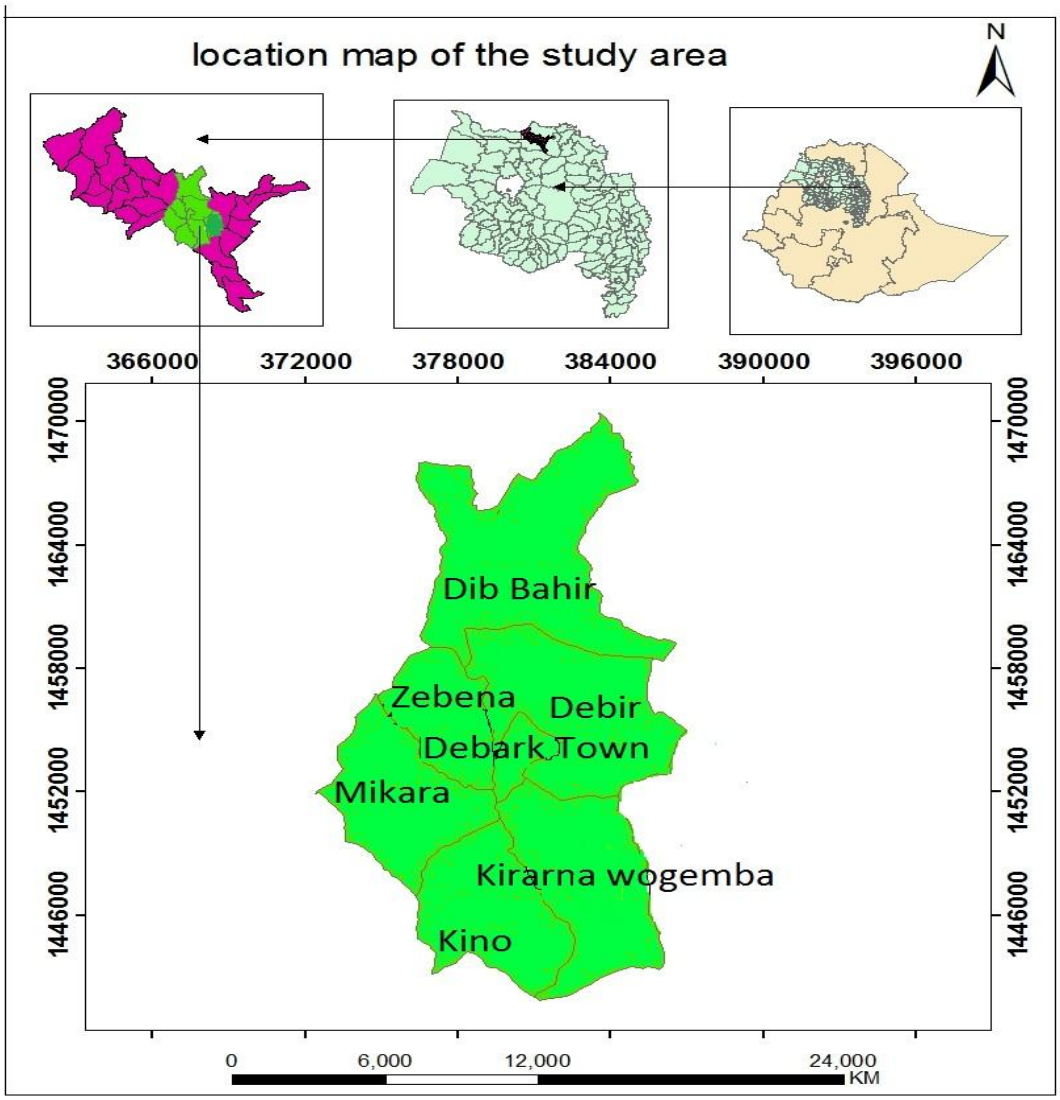

Figure 1 : Map of the study area

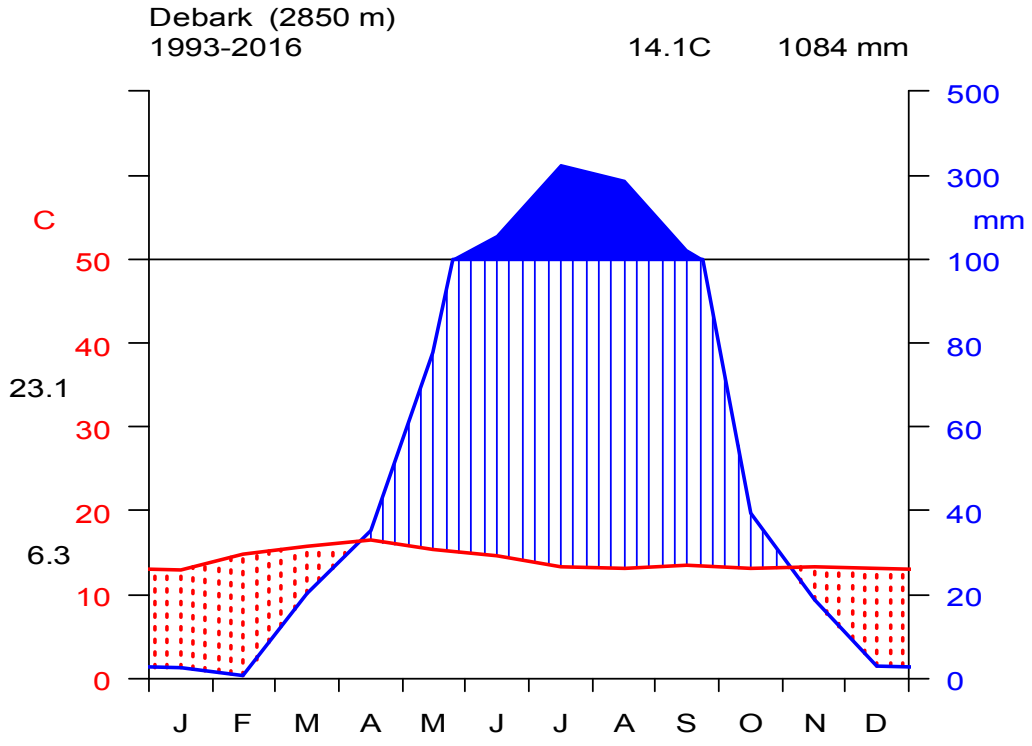

Figure 2: Climadiagram showing the mean annual temperatures and rainfall (from 1993-2016) of Debark District (Source: NMSA, 2017).

6.1.2. Soil, land use and drainage

The dominant soil types are brown soil with 45% followed by 29% gray soil, 18% black soil and 8% red soil. According to (DDARDO, 2016), Debark District has a total area of 282,105hectares (282.105 km^2) of which 25.8% is under cultivation for growing both annual and perennial crops, while 35.4%, 30.8% and 6.7% of the total land area is occupied by grassland and bareland, pasture and forest respectively. From the total area, 13,408 hectares are urban and the remaining part is by rural. In the District, there are many small and large rivers (Asera,Anbera,Angoba, Araro,Belegeze, Cilo, Dekiko,Meytmket and Mingero,) that have been providing an irrigational function under a traditionalsystem such as Anbera and Asera. These could be the topography, vegetation and rainfall pattern in the district encourages the existence of many perennial rivers.

6.1.3. Vegetation

Due to variation in altitude and topographical features, the Debark District vegetations show three different zones, namely: Afromontane forest(2,000-3,000 m), Ericaceous/sub alpine (3000-3200 m) andafroalipine vegetation(above 3600m) (Zerihun Woldu, 1999;Puff and Sileshi Nemomissa, 2005; Getinet Masresha, 2014). The common plant species of the study area include: *Achyranthes aspera, Albizia schimperiana, Alchemilla pedata, Apodytes dimidiata, Bruceaantidysenterica, Dombeya torrida, Embelia schimperi, Erica arborea, Festuca gilbertiana, Lobelia rhynchopetalum, Hagenia abyssinica, Hypericum revolutum, Jasminum abyssinicum, Juniperus procera, Kniphofia foliosa, Lobelia giberroa, Maytenus arbutifolia, Millettia ferruginea, Nuxia congesta, Olea capensis, Olea europaea* subsp. *caspidata, Papaneasimensis, Pittosporum viridiflorum, Prunus africana, Phytolacadodicandra, Salix subserrata, Schefflera abyssinica, Thymus schimperi*and *Zehnaria scabra*.

6.1.4. Population healthcare status, socioeconomicactivity and education

The total population of the District is about 155,591 (urban + rural) of which 793, 44 are males and 76247are females. The largest ethnic group reported in Debark is the Amhara (99.42%) who are speakingAmharic language and the rest percentages (0.58%) speak other languages. About 93.78% practiced Ethiopian Orthodox Christianity and 6.16% of the inhabitants are Muslims.

According to the report of Debark District Health Office (DDHO, 2016), the first ten major diseases in the area are: Pneumonia, Malaria (caused by *P.falciparum*), acute febrile illness, Dyspepsia, Malaria (caused by other than*p. falciparum),* Diarrhea (non-bloody)*,* Helminthiasis*,* Infection of the skin*,* Diarrhea with blood(dysentery) and Others (unspecified).Among these, Pneumonia is the most prominent health problem in the District.

In Debark District, there is1 hospital, 33 health posts (tenakela) 10 health stations, 4 private clinics and 4drug stores and 22 veterinary clinics. As well, 14 traditional healers, 13 “wagesha” and 24 witchcrafts men (“tenkuay”) are available in the district (DDHO, 2017).

The economy of the local people is predominately based on subsistence cultivation of crops and livestock husbandry.According to DDARDO (2015) annual report, 28063.6 hectares of land are used for farming different crop types. Major food crops grown in debark district are listed (Appendix 4).

Livestock population of the area includescattle, sheep, goats, donkeys, horses, mules, hens, camel and traditional and modern hives. Major livestock ailments reported include anthrax, blackleg, pleuro-pneumonia, hemorrhagic- septicemia, coccidiosis, internal and external parasites, and render pest.

According to DDEO (2016), there are 254 adult basic education centers, 81 first cycle school (1-4), 47 elementary schools (5-8) and 2 secondary schools (9-10), one preparatory (11-12) and one technical and vocational education schools in the district.

6.2. Reconnaissance Survey

A Reconnaissance survey of the study area was conducted from October 3-10, 2017 to identify study sites, to observe altitudinal variation and vegetation type and as well as life system andlife constraints in the district.

6.3. Study sites and informants selection

Out of the total 33 Kebeles (small administrative area), in Debark District Ten were selected purposefully for ethnobotanical data collection based on the altitudinal variation, vegetation distribution and availability of traditional medical practitioners. Information about the sampled kebeles was gathered from kebele administration leaders, elders, religious leaders, students, and other local inhabitants. The names of sampled study kebeles are Arba tensa, Debark town (01, 02, and 03 kebeles), Debir, Dib Bahir, Kino 1, Kirarena wogemba, Miqara and Zebena(Fig.1).

A total of 62 informants (About 5-7 from each kebele) both males (45) and females (17) the agebetween 22-74 were selected during data collection with purposive and random samplings methods according to Jarssso Belay (2016). A total of 22 key informants (20 males and 2 females) were selected with purposivesampling method based on comments and recommendations from different societal groups listed above. In addition, identified traditional practitioners were also invited to suggest other traditional practitioners. On the other hand, general informants were selected randomly using lottery methods to check indigenous knowledge sharing system within the community.

6.4. Ethnobotanical data collections techniques and procedures

Ethnobotanical data were collected from November 2 –February 10, 2017 following the method of Martin (1995), Cotton (1996) and Cunningham (2001). Accordingly, data were collected with guided field walks, individual and group discussions and market surveys through semi-structure interviews. All of the interviews were held based on the check list of questionnaires (Appendix 8) prepared beforehand in English language and translated into Amharic by the help of asperities. Following this, interviews and discussions were carried out with informants and key informants. Informant consensus was considered and both quantitative and qualitative data were collected following the prepared questions. The place and time for discussion were settled on the interest of the informants.

6.4.1. Informant's Consensus

In order to confirm the reliability of the information each informant was contacted at least twice and if the responses that were given at different time contradict each other, they were considered to be unreliable and were rejected or reliability of the information can be confirmed by similarly of information given by different informants on the same issue (Getu Alemayehu, 2010).

6.4.2. Individual interview and group discussions

Individual discussions were performed with the researcher and the informants during data collection. This was mostly applied to gather the medicinal plants and associated information secretly. In the same way, Group discussions were made with informants regarding the medicinal plants in the study sites. Information on local names of the plants, indigenous knowledge on medicinal plants, threats to plants, conservation and management of plants, and related data were recorded.

6.4.3. Guide field walk

During the guide field walk, the traditional medical practitioners went together with the researcher to the place where the medicinal plant is growing to show them and explain his additional ethnomedicinal knowledge practically. All valuable data and plant specimens were recorded in the field with the help of ethnobotanical guiders.

6.4.4. Market survey

During the study, a market survey at (Debark town) was made to distinguish and record the type of herbal drugs sold in the market and the multipurpose role of some medicinal plants according to a checklist of questionnaires (Appendix 8).

Figure 3: Individual interviews at field (A) and market (B)

6.5. Specimen collection and identification

Plant specimens collections were performed with help of guided field walks and the plant specimens were pressed and dried for voucher. Identification of the plant specimens was done both in the field and later at the UoGH using taxonomic keys, Flora of Ethiopia and Eritrea and confirmed with taxonomists. Finally, the identified medicinal plant specimens were mounted, labeled and stored in UOGH as Voucher.

6.6. Data Analysis

A descriptive statistical method such as percentage and frequency was employed to analyze and summarize the data on medicinal plants, use, and associated knowledge. The most useful information gathered on medicinal plants reported by local people: application, methods of preparation, route of application, disease treated, and parts used and the habit was analyzed through descriptive statistics. Facilities in MS Excel spreadsheet were utilized to make simple calculations and draw different graphs. In addition, some ethnobotanical analytical tools including fidelity level index, preference ranking, direct matrix ranking, pairedcomparison, Jaccard`s Coefficient of Similarity (JCS and informant consensus factor were used for data analysis. The detailed information about each technique is presented as follows:

6.6.1. Fidelity level index(FL)

The fidelity level index (FL), the percentage of informants claiming the use of a certain plant for the same major purpose, was also calculated for the most frequently reported diseases or ailments using the following equation (Friedman *et al*., 1989).

FL= (Ip/Iu) x100

Where, **Ip** is the number of informants that claim the use of a plant species to treat a particular disease, and **Iu** is the number of informants that use the plants as medicine to treat any given disease.

6.6.2. Preference Ranking

Preference/priority ranking was conducted for evaluating the degree of preferences or levels of importance of certain selected plants or parts of plants following Martin (1995). Accordingly, six purposively selected key informants were invited to rank six medicinal plant species that are used for the treatment of headache. Values of 1 for the least preferred plant to 5 for plant species most preferred were used and values were summed up. Finally rank was given to each plant species.

6.6.3. Direct matrix ranking

Direct matrix ranking was performed to assess the relative importance of each plant. Six commonly reported multipurpose species and seven use categories were involved in direct matrix ranking. Five key informants were purposively selected to assign use values (0 = not used, 1 = least used, 2 = less used, 3 = good, 4 = very good, and 5 = excellent.) Accordingly, each key informant gave use values for the six multipurpose medicinal plants and average values of use diversity for species was taken and the values of each species were summed up and ranked.

6.6.4. Paired Comparison

Paired comparison can be used for evaluating the degree of preferences or levels of importance of certain selected plants/ parts of plants (Nemarundwe and Richards, 2002).Martin (1995) described that the number of pairs was calculated by the formula, n (n-1)/2, where n is the

number of items. Paired comparisons to indicate the efficacy of five medicinal plant species used to treat fibril illness (which is frequently occurred in the study area) were employed as described by Martin (1995). In such a way that six key informants were randomly selected by flipping coins and allowed to show their responses independently for pairs of five traditional medicinal plants that are noted for treating fibril illness. A list of the pairs of selected items with all possible combinations was made and sequence of the pairs and the order within each pair was randomized before every pair is presented to selected informants and their responses were recorded, total values were summarized and rank was made based on the report of the informants.

6.6.5. Informant Consensus Factor(ICF)

It was calculated for each individualailmentto identify the agreements of the informants on the reported cures using the formula given by Luiz *et al*., 2005 and Tilahun Teklehymanot and Mirutse Giday, 2007).

$$\mathbf{ICF} = \frac{\boldsymbol{nur - nt}}{\boldsymbol{nur - 1}}$$

Where$\boldsymbol{nur}$ is number of use citations (respondents) for each ailment and $\boldsymbol{nt}$ is the number of species used. The factor provides a range of 0 to 1, where a high value acts as a good indicator for a high rate of informant consensus.

6.6.6. Jaccard`s Coefficient of Similarity(JCS)

Jaccard`s Coefficient of Similarity (JCS) was carried out in order to see species similarity among different study sites. It was computed between the study areas with other areas studied by other researchers in different parts of the country. JCS was calculated as following. Kent and Coker(1992)

$$\mathbf{JCS}=\frac{\boldsymbol{C}}{(\boldsymbol{a+b+c})}$$

Where JCS= Jaccard`s Coefficient of Similarity

a= Number of species which is found in habitat A

b= Number of species found only in habitat B and

c= Number of common species found in habitats A and B

6.7. Ethical Considerations

Consent letters were received for all data collections from Debark District Agricultural and Rural Development sector. In additions, informants have given their valuable data according to their oral consent for the research purpose only.

7. RESULTS AND DISCUSSION

7.1. Indigenous Knowledge on Soil, Landform, and Vegetation Classification

7.1.1. Soil classification by indigenous people

The local people classify soil based on soil characteristics such as the color of the soil, fertility of the land, and other criteria. The following soil types have been identified by local people:

Walka Afer: This soil type refers to black soil and with better fertility for crop production in comparison to other soil types. The people use this soil to grow crops like *Eragrostis tef, Sorghum bicolor, Zea mays, Triticum aestivum* and others.

Shasherma: Mix of both red soil and black soil type suitable for crop production such as *Guizotia abyssinica*and *Eragrostis tef*.

Key Afer: This soil is red soil type; it is less fertile in comparison to the black soil. But, it can enable to grow crops of various types by applying fertilizer. The people use this soil to grow crops like *Hordeum vulgare*, *Triticum aestivum*and*Linum usitatissimum*.

Nech Afer: This type of soil is white soil which is not suitable for crop production.

7.1.2. Landforms Classification

The local people of the study area classify landforms based on the topographic land setting. These are:

Terrarama: Mountain area characterized with higher altitude and covered with vegetations.

Wotageba: undulated lands that not used for grazing land or agricultural activities.

Medama: This refers to plain land on which settlement, agricultural activities as well as livestock grazing are practiced.

Korebta: Refers to a smaller elevation (hills) compared to Terrarama, sometimes on which agriculture, grazing, and other practices can be performed.

Shelequama: This refers to gorge lands which are found in between elevated land forms.In each soil and land formsemic classification, indigenous people able to identify the habitats of medicinal plants in the study area.This classification method is also indicated in previous studies in Ethiopia (Endalew Amenu, 2007; Getinet Chekole, 2011; Mengistu Gebrahiwot, 2010).

7.1.3. Indigenous vegetation classification (Emic categorization)

The local people also have techniques of classifying vegetation into three main types:

Chaka or Den: This type of vegetation is with densely populated plant species and composed of a range of larger trees, where many wild animals dwell.

Kutquato: Open woody and shrub land with patches of bushes, shrubs, and herbaceous species. It is common near to agricultural margins and mountain escarpments.

Yesar Meda: Refers to an area covered by grass and serves especially as grazing land.

7.2. Medicinal plantsdiversity and habitats

A total of 93 medicinal plants which are belonging to 86 genera and 51 families were documented from the study area. Out of these, 50 species (53.76%) were noted to treat only human ailments while 3 species (2.23%) were used to treat livestock ailments and 40 species (43.01%) were used to treat both human and livestock ailments. In terms of species composition, family Asteraceae was represented by a highest number of medicinal plants species (7 species) followed by Solanaceae (6 species), Lamiaceae and Euphorbiaceae (5 species each) (Appendix 3).

From the total of 93 medicinal plant species documented in the district, 60 species (64.52%) were collected from the wild/natural vegetation and this indicates that there is a significant harvesting pressure on the wild plant source of the study area. The remaining percent, constitute 6 species (6.45%) were collected both from cultivated and wild vegetation, whereas 27 species (29.03 %) were collected from cultivated fields (Fig.4). This is consistent with the findings of Getu Alemayehu (2010) that traditional medicinal plants were harvested mostly from wild vegetation followed by homegardens.

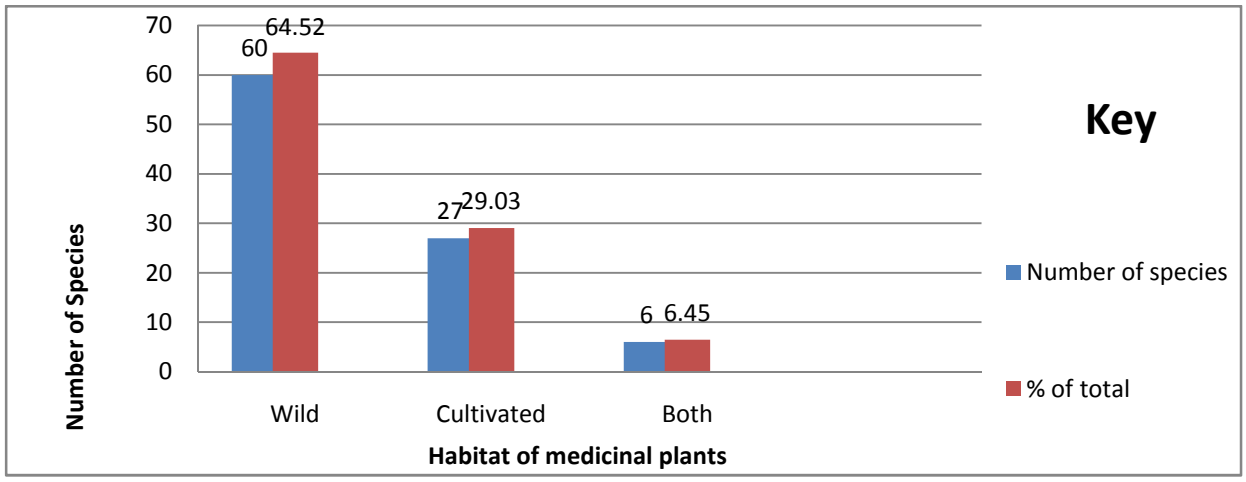

Figure 4: Habitats of medicinal plant species

7.3. Habits and parts used of medicinal plants

Out of the total 93 medicinal plants collected from the study area, 34 (36.56%) were herbs species followed by 31 (33.33%) shrubs species (Fig.5). This may be due to a high level of abundance of these habits in the study area compared to tree and climber species. Relatively high number of herbs and shrubs for the medicinal purpose has also been reported previously by HaileYineger (2005), Abiyu Enyew *et al*. (2014), Tadesse Beyene (2015), Tena Regassa (2016) and Tewodros Tesfaye (2016). In contrast, the findings of Getu Alemayehu (2010), Getnet Chekole (2011) and Sintayehu Tamene (2011) revealed that shrubs were the most used ones.

The study showed that the widely used plant part for the preparation of the remedies in the study area were leaves (28 cases, 40%) followed by roots (13, 18.57%) and seeds (9, 12.86%).Plant parts such as stem, bark, fruit, and bulb were also reported for the remedy preparations (Table 1). The findings of the study showed that the plant parts which are mostly used for the preparation of the remedies in the study area were leaves and harvesting of leaves has less impact due to some leaves are leftover onthe mother plant.Fortunately, the remedy preparation that involves roots, rhizomes, bulbs, barks, stems has effects on the survival of mother plants compared to leaves.

This finding is similar to the results of other ethnomedicinal studies (Endalew Amenu (2007); Haile Yineger (2005) and Mulugeta Kuma (2014) who had reported that leaves were the most cited plant parts used in remedy preparations. But a study conducted by TizazuGebre (2005) in Konso special wereda revealed that roots were the most used plant parts.

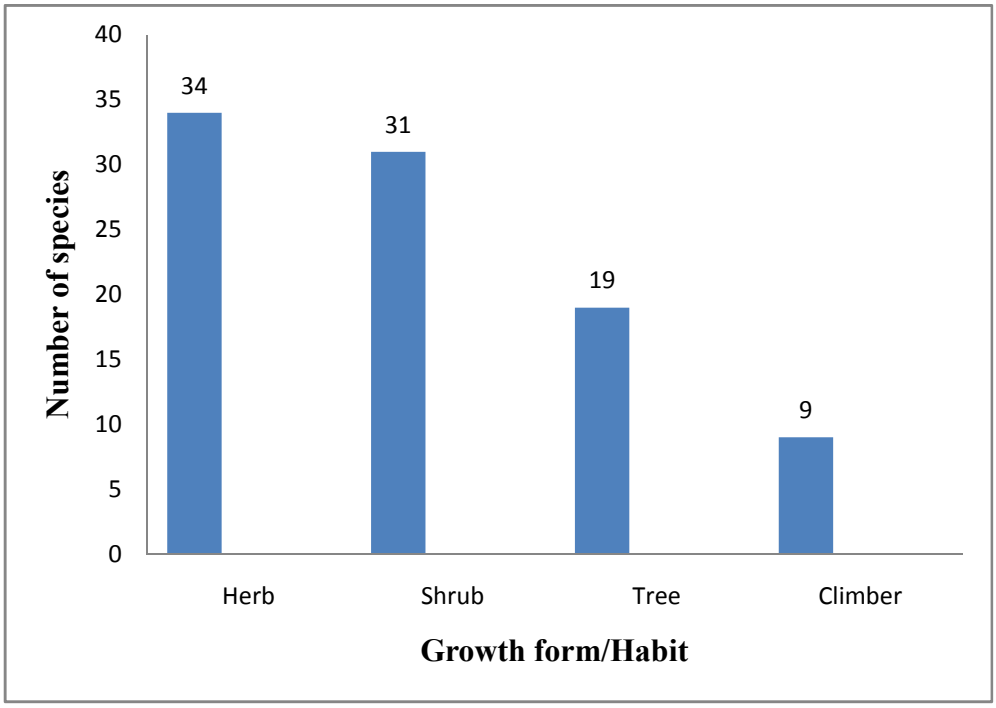

Figure 5: Growth forms of medicinal plants

Table 1: Plant parts used in the preparation of the remedies

Plant parts used	**The frequency of each uses**	**Total frequency of uses in Percentages (%)**
Leaf	28	40
Root	13	18.57
Seed	9	12.86
Root and leaf	7	10
Stem	6	8.57
Bark and fruit	4	5.71
Above ground, bulb, tuber, fruit, and seed	2	2.86
Flower, rhizome, latex, root bark and shoot	1	1.43
Total	**70**	**100**

7.4. Mode of preparation and route of administration

Concerning the preparation of traditional medicine, the local people employ various methods of preparation of traditional medicines for different types of ailments. The principal method of traditional medicine preparation reported was in the form of crushing (25, 20%) followed by pounded and mixed (23, 18.4%)(Table 2).This is due to the effective extraction of the plant gives immediate response for health problems when crushed or pounded to increase its curative potential. The result is consistent with the findings of Getnet Chekole (2011) in which crushing is highly reported method of remedy preparation. But it disagrees with the report of Jarsso Belay (2016) which revealed that squeezing is the most used preparation method.

The most widely used route of administration was oral accounted for 153(56.67%) followed by dermal 80(29.63%) (Table 2).This is the reason that oral and dermal routes permit rapid physiological reaction of the prepared medicines with the pathogens and increase its curative power. This finding agrees with some previous reports in Ethiopia (Behailu Etana 2010), EndalewAmenu, 2007) and Getnet Chekole 2011).

Table 2: Mode of preparation and route of administration

Forms of preparation	**Total preparation**	**% of total**	**Route of administration**	**Remedy counts**	**Percent (%)**
Crushing	25	20	Oral	153	56.67
Pounding and mixing	25	18.4	Dermal	80	29.63
Pounding and powdering	23	17.6	Nasal	19	7.04
Squeezing	21	16	Optical	6	2.22
Chewing	18	14.4	Auricular	5	1.85
Pounding and squeezing	6	4	Nasal and oral	4	1.48
Decoction	5	4	Neck	3	1.11
Cooking	2	1.6			
Total	**125**	**100**		**270**	**100**

7.5. Ways of applications and dosage of plant remedies

The prepared traditional medicines were applied in a number of methods, among which drinking (37.57%), creaming (16.76%), and eating (10.40%) were mentioned (Fig. 6). This finding is consistent with the finding ofBehailu Etana (2010) and Endalew Amenu (2007) in which drinking accounted the largest percentage of remedy taking way.

The dosage of medicine to be administered is given by estimating age, the physical condition of the patient and the severity of the diseases. Amounts to be administered is also estimated by the use of measurements such as length of a finger (for bark, root and stem length), pinch (for powdered plant material) different measuring materials (e.g. spoon, coffee cup, tea cup and glass cups) and number count (for sap/extract drops, leaves, seeds, fruits, bulbs, rhizomes and flowers).But these measurements are not accurate enough to determine the precise amount. Some of the medicinal preparations are reported to have adverse effects on the patients. Informants reported that*Hageniaabyssinica, Phytolacca dodecandra* and some others are found to have adverse side effects like stomach pain, vomiting and diarrhea. The informants recommended additives for some of these adverse side effects, such as drinking of milk and barley soup immediately after intake of medicinal plants.

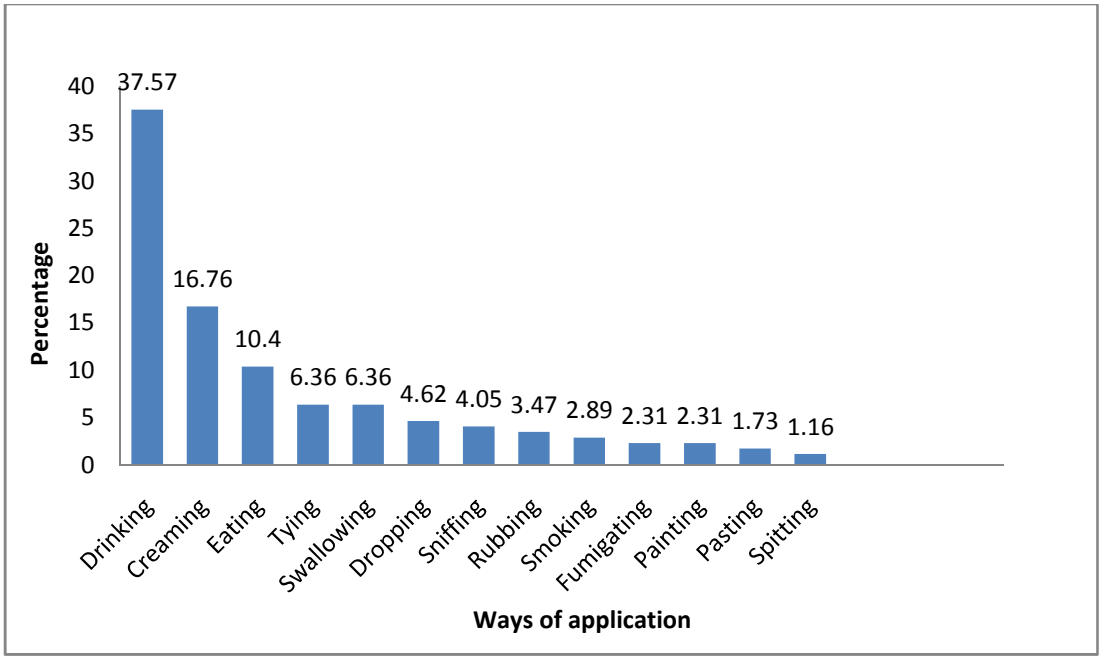

Figure 6: Application ways of remedies for human and livestock ailment treatment

7.6. Conditions of preparation of remedies

The results showed that majority of the remedies are prepared using fresh material (50, 53.76%), while 15 species (16.13%) were used in the case of dried plant material and 28 (30.11%) either fresh or dried. Similar studies were also conducted by Mengistu Gebrahiwot (2010) and Tadesse Beyene (2015) which showed that using fresh materials for different health problems is more than dry materials or dry or fresh. This could be due to the fact that the fresh materials are not to lose its volatile bioactive chemicals like oils, which could deteriorate on drying.

7.7. Major human diseases in the study area

In the studyarea, a total of 44 diseases of humans recorded were treated with a total of 50 plant species, where one species can treat a single disease or a number of diseases. Similarly, one ailment can be treated with a combination of plant species or single plant. For example, Wound is treated with 25 species of plants, malaria and stomach-ache with 14 species each, body swelling and evil eye with 10 species each, tonsillitis with 9 species. Fibril illness, scabies (itches) and skin rash with 7 species each (Appendix 5).

7.8. Livestock diseases in the study area

In comparison to human diseases, livestock diseases are treated with a few number of plant species in the study area. A total of 13 livestock ailments were identified that are treated by traditional medicinal plants in the area. Common diseases affecting livestock health in the study area are bloating which is treated by 10 species, anthrax and leech by 6 species each, ectoparasite (lice) by 5 species, rabies by 3 species, erythroblasts, horse disease, retained placenta and coccidiosis are treated by 2 species each and the remaining diseases are treated by 1 species each (Appendix 6).

7.9. Marketability of medicinal plants

In the present study area, the results obtained from market assessment of local market (Debark) town, showed that most of the medicinal plants are not only traded for medicinal purposes, but also for other different uses (Appendix 7).This Some of these reported marketable medicinal plants were sold and purchased as spices (*Allium sativum, Allium cepa, Artemisia abyssinica, Capsicum annuum, Coriandrum sativum, Lepidium sativum, Nigella sativa, Ocimum basilicum, Ruta chalepensis, Schinus molle, Trigonella foenum-graecum* and *Zingiber officinale*), oil seeds

(*Brassica carinata, Brassica nigra, Linum usitatissimum, Guizotia abyssinica* and *Ricinus communis, Sesamum indicum*), food crops (*Carica papaya, Citrus limon, Cucurbita pepo,Prunus persica),* narcotic(*Rhamnus prinoides, Coffea arabica, Syzgium aromaticum*and *Thymus schimperi*),fumigants (*Echinops kebericho, Lobelia rhynchopetalum, Olea europaea* subsp. *cuspidata* and *Otostegia integrifolia)* and for firewood, construction and material needs (*Cordia Africana Croton macrostchyus* and *Eucalyptus globulus*). This result is similar with the study reports of Tena Regassa (2016) and Getu Alemayehu (2010).

7.10. Ranking of Most Important Medicinal Plants

7.10.1. Informant Consensus

The results of the study showed that some medicinal plants are popular than others. In this study the highest informant consensus goes to *Zehneria scabra*and *Ocimum lamiifolium* which are cited by 58 (94%) and 52 (84%) informants respectively (Table 3). The popularity of these medicinal plants is due to the preference of the species for treatingfebrile illness in the community. This could be their easy access in the home gardens of many people and effectiveness.

Table 3:The top six selected medicinal plantsand the corresponding informants

Scientific Name	Total number of citation	Percentage (%)	Rank
Zehneria scabra	58	94	1st
Ocimum lamiifolium	52	84	2nd
Allium sativum	46	74	3rd
Ruta chalepensis	42	68	4th
Kosteletzkabegonifolia	36	58	5th
Phytolacca dodecandra	31	50	6th

7.10.2. Informant consensus factor(ICF)

The results of the study showed that diseases that are frequent in the study area have higher informant consensus factor. It is further shown that medicinal plants that are effective in treating certain diseases and well known by community members also have higher ICF values. Accordingly, plants against fibril illness have high ICF scoring 85% followed by plants against tapeworm scoring 78% (Table 4).

Table 4: The top Informant Consensus Factor (ICF)

Aliment treated	nt	nur	%	ICF	% ICF
Fibril illness	7	41	66.13	0.85	85
Tapeworm	5	19	30.65	0.78	78
Leech	6	19	30.65	0.72	72
Evil eye	10	27	43.55	0.65	65
Malaria	14	37	59.68	0.64	64
Tonsillitis	9	22	35.48	0.62	62

7.10.3. Paired Comparison

The paired comparison result showed that *Zehneria scabra* species stood first for the treatment of fibril illness and *Otostegia integrifolia*, *Verbena officinalis*and *Lepidium sativum* were 2nd, 3rd, and 4th respectively (Table 5). *Eucalyptus globulus* was the least preferred species to treat the disease in the study area.

Table 5: Results of paired comparison on five medicinal plants against fibril illness

Medicinal plant species	Respondents							
	R_1	R_2	R_3	R_4	R_5	R_6	Total	Rank
Eucalyptus globulus	3	3	2	2	3	2	**15**	**5th**
Lepidium sativum	3	2	2	3	3	3	**16**	**4th**
Otostegia integrifolia	3	4	3	3	4	3	**20**	**2nd**
Verbenaofficinalis	3	2	4	3	4	3	**19**	**3rd**
Zehneria scabra	4	4	4	3	4	3	**22**	**1st**

7.10.4. Preference ranking

In the study area, six medicinal plants were reported as effective to treat a headache. Six informants ranked these six plants based on their perception of the degree of effectiveness. Accordingly, *Ocimumlamiifolium* is the most effective medicinal plant to treat a headache followed by *Ocimum basilicum*, *Clerodendrum myricoides, Ricinus communis, Datura*

stramonium as 2nd, 3rd, 4th and 5th respectively, whereas*Cynoglossum coeruleum* was found to be the least preferred species (Table 6).

Table 6: Preferance ranking of six selected medicinal plants used for treating headache

Species	Respondents(R_1-R_6)						Total	Rank
	R_1	R_2	R_3	R_4	R_5	R_6		
Ocimum lamiifolium	6	5	6	5	6	5	33	**1st**
Ocimum basilicum	5	6	5	6	4	6	32	**2nd**
Clerodendrum myricoides	4	3	4	4	5	4	24	**3rd**
Ricinus communis	1	2	3	3	2	3	14	**4th**
Datura stramonium	2	4	1	2	3	1	13	**5th**
Cynoglossum coeruleum	3	1	2	1	1	2	10	**6th**

7.10.5. Direct matrix ranking

The results of direct matrix ranking result showed that *Olea europaea* subsp. *cuspidata* ranked first followed by *Acacia abyssinica, Eucalyptus globulus, Hagenia abyssinica*,*Cordia Africana* and *Croton macrostachyus* (Table 7).

The result indicates that *O. europaea* subsp. *cuspidata, A. abyssinica,* and *E. globulus* are the most preferred medicinal plants used for various uses and they are the most threatened species as reported by the informants. However,*E. globulus* is also known to relatively have diverse use next to *O. europaea* subsp. *cuspidate* and*A. abyssinica*, it is less threatened as it is planted and managed by humans. The direct matrix ranking result also shows that the local people harvest the six multipurpose plant species mainly for firewood followed by charcoal,Fencing,Construction, medicine, forage and food (Table 7).Thus the long term survival of these top ranked species is under question if their exploitation continues with the existing rate.

Table 7: Direct matrix ranking of six medicinal plant species based on their use diversity

Plant Species	Use categories							Total	Rank
	Charcoal	**Construction**	**Fencing**	**Fire wood**	**Forage**	**Food**	**Medicine**		
Acacia abyssinica	5	1	5	4	4	0	1	**20**	**2nd**
Cordia africana	2	5	2	3	1	2	2	**17**	**5th**
Croton macrostachyus	3	2	2	3	2	0	4	**16**	**6th**
Eucalyptus globulus	3	5	4	5	0	0	2	**19**	**3rd**
Hageniaabyssinica	2	2	2	2	3	2	5	**18**	**4th**
Olea europaea subsp. *cuspidata*	5	3	4	4	3	0	3	**22**	**1st**
Total	**20**	**18**	**19**	**21**	**13**	**4**	**17**	**112**	
Rank	2nd	4th	3rd	1st	6th	7th	5th		

7.10.6. Jaccard`s Coefficient of Similarity (JCS)

The results of the comparison by using Jaccard coefficient of similarity indicated that the highest degree of similarity was observed with the study conducted byMengistu Gebrahiwot, 2010(35%) followed by Getu Alemayehu, 2010(33%) followed by Mulugeta Kuma, 2014(28%), then Tewodros Tesfaye, 2016(27%). The least similarity was linked with the study conducted byJarsso Belay, 2016(20%) (Table 8). According to Behailu Etana (2010) the highest degree of similarity observed between two or more study areas is due to socio-cultural factors that could contribute to the medicinal plant knowledge base of people or the nearness to each other of the studyarea. In contrast, the lowest degree of similarity might be due to vegetation difference of the two study areas and Cultural difference of the two groups of people.

Table 8: The Jaccard coefficient of similarity of Debark District with five other areas with respect to medicinal plant composition.

Sample area	a	b	c	JCS%	Sources
Debark District	93	-	-	-	
Jigjiga District	50	26	24	20	Jarsso Belay, 2016
Jima Rare District	82	46	36	28	Mulugeta Kuma, 2014
Melka Belo District	66	32	34	27	Tewodros Tesfaye, 2016
Minjar-Shenkora District	118	66	52	33	Getu Alemayehu, 2010
Seru District	121	65	56	35	Mengistu Gebrahiwot, 2010

7.10.7. Fidelity level index (FL)

Fidelity level (FL) values were calculated for some commonly used medicinal plants against some commonly reported ailments.The top known plants species are: *Zehneria scabra*, *Allium sativum*, *Ruta chalepensis*, *Phytolacca dodecandra, Hagenia abyssinica*, *Achyranthes, Justicia schimperiana* and *Echinops kebericho* (Table 9). The medicinal plants that are widely used by the local people to treat one ailment have higher FL values than those treated more than one ailment (TilahunTeklehaymanot and Mirutse Giday, 2007). For example, *Zehneria scabra* was reported by many informants to treat fibril illness and hence, it had 95% FL. High FL could also be an indication of the efficiency of the reported plant to cure the specific ailment.

Table 9: Fidelity Level Index some medicinal plants

Plant species	primary use for	Ip	Iu	FL	FL%
Zehneria scabra	Fibril illness	58	61	0.95	95
Allium sativum	Malaria	46	50	0.92	92
Ruta chalepensis	Stomach-ache	42	45	0.93	93
Phytolacca dodecandra	To stop pregnancy	31	35	0.89	89
Hagenia abyssinica	To expel tape worm	28	31	0.90	90
Achyranthes aspera	Body swelling	23	29	0.79	79
Echinops kebericho	Evil eye	18	22	0.82	82
Justicia schimperiana	Cocoidiosis	15	18	0.83	83

7.11. Transfer of Medicinal Plant Knowledge

IK on remedies in many countries passes from one generation to the other generation verbally with great secrecy (Jansen, 1981). Such secret and crude transfer makes indigenous knowledge or ethnomedicinal knowledge vulnerable to distortion and in most cases, some of the lore is lost at each point of transfer (Amare Getahun, 1976). The traditional healers want their knowledge to be held secret and the knowledge of plant remedies remained in their hands (Mirutse Giday *et al*., 2003). Medicinal plant knowledge, use and transfer of knowledge to the young generation can be affected by religious, beliefs, modernization, acculturation, and environmental change (Behailu Etana, 2010; Mekonnen Lemma, 2001 and Ermias Lulekal, 2014).In a similar way, the respondents in the study site also reported that the transmission of TK is disrupted because of modernization and most respondents transfer their knowledge to their family. Few others share to trustworthy and lovely neighbors and other blood relation persons. A major problem observed during the study was that few of highly traditional skilled and knowledgeable persons are rigid to tell information. This is because it is a means of income generation and they believe that the medicinal plant is less effective in treating a certain ailment if everybody knows it. On the other hand, most of the time knowledgeable persons were locally said to be 'Debtera' and or 'Tenquay'. They were also called as 'sir mash' (root excavators), and 'kitelbetash' (leaf cutter). Due to these problems, the traditional medicine practitioners had forced to keep their knowledge and practices in secret.

7.12. Threats and conservation of medicinal plants in the study area

7.12.1. Threats to medicinal plants

The cause of threats to medicinal plants in the study area can be grouped into natural and anthropogenic factors. Anthropogenic factors affect the medicinal plants in the area are: agricultural expansion, firewood, charcoal, timber, construction woods, medicinal plants trade for different uses and others are contributing factors to the loss of plant species in general and medicinal plants in particular. Similar findings were also reported in Ethiopia by (Endalew Amenu, 2007; Getnet Chekole, 2011 and Behailu Etana, 2010) that showed need for agricultural

land and for other uses severely threatened plant species in general and medicinal plants in particular.

Likewise, natural causes include prolonged drought and wildfireis also well-known causes in the study area. According to the traditional healers, nowadays searching for medicinal plants require a long time and moving long distance even going to a neighboring country (e.g. until Eritrea and Sudan) to collect desert and lowland grown medicinal plants.

7.12.2. Conservation of medicinal plants and associated knowledge

Local people of the area know the importance of conserving the plants in both ex-situ and in-situ conservation methods. For instance, some people have started conserving the plants in fenced/protected pasture land; in different worship areas (churches, mosques) in their farms' field/farm margins and around their home gardens and live fences of the Famers. Getnet Chekole (2011) and Nigussie Amsalu (2010) have also reported that different worship areas are conservation sites for remnant vegetation in general and medicinal plants in particular.

For instance, medicinal plants like *Juniperus procera*, *Olea europaea* subsp.*cuspidata, Euphorbia abyssinica* are found in church forest and also plants like*Hageniaabyssinica*, *Ocimum urticifolium*and *Ruta chalepensis*are found in the majority of home gardens in the study area, as they need these plants in their daily life as spices, medicine or for other values. Plants such as *Acacia abyssinica* and *Cordia africana* are also left as remnants of forest in the agricultural field due to their uses as timber source, for construction and fuel wood.

8. CONCLUSION

The ethnobotanical study of medicinal plants in Debark district showed that medicinal plants are used by a large member of the population and it is the most important means of treating some common human and livestock ailments**.**

Most medicinal plants collected and identified were herbs and all plant parts were used for preparation of remedies.

However, the use of medicinal plants for multiple purposes is leading to depletion in an alarming rate. This is worthy because of some of the uses (Agricultural expansion, firewood, construction, forage, charcoal.) are the major destructive.

Threats that erode indigenous knowledge usually comes from secrecy, oral-based knowledge transfer, the unwillingness of young generation to gain the knowledge, unavailability of the species, the influence of modern education and awareness factors are the major ones.

The results of this study also showed that cultivation of plant species in and around home gardens for different purposes have great contribution to the conservation of medicinal plants and the associated knowledge.

9. RECOMMENDATIONS

Based on the results of the study, the following recommendations are forwarded.

- Integrated conservation and management program on medicinal plants focused on awareness development and active involement of local community, governmental and non gevrmental bodies shall be practiced in the district.
- Young generation needs raising awareness to avoid negative impacts on the medicinal plants and associated knowledge in the area, hence, documentation of the medicinal plants of the area needs to be continued.
- Avoid uprooting of the plant species for medicinal purpose particularly before its flowering, fruiting and/seeding. If possible, it is better to use other parts of the medicinal plants such as leaves instead of root to protect them from the risk of extinction and endangering the species by collecting the roots or barks of the plants.
- Establishing traditional healers associations by providing supports like land, fund and assistances for cultivations of medicinal plants in the district would help to conserve medicinal plants.
- Further phytochemical investigation should be carried out on top important medicinal plants.

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APPENDICES

Appendix 1: Lists of plants collected from the study area (D=dry; F=fresh; DF= dry or fresh; Cl=climber; H=herb; Sh=shrub; T=tree; AA= Asmera Amde)

No	Scientific name	Family	Local name	Condition of plant	Plant habitat	Habi
1.	*Acacia abyssinica* Hochst. ex Benth	Fabaceae	Girar	F	wild	T
2.	*Achyranthesaspera* L.	Amaranthaceae	Talenj	F	wild	H
3.	*Allium cepa* L.	Alliaceae	Qey shenkurt	F	cultivated	H
4.	*Allium sativum* L.	Alliaceae	Nech shinkurt	F	cultivated	H
5.	*Aloe pubescens* Reynolds	Aloaceae	Eret	F	wild	H
6.	*Artemisia abyssinica* Sch. Bip.ex A. Ri	Asteraceae	Harit	F	wild	H
7.	*Asparagus africanus* Lam.	Asparagaceae	Yesetkest	F	wild	Cl
8.	*Brassica carinata* A.Br.	Brassicaceae	Gomenzer	D	cultivated	H
9.	*Brassica nigra* L.	Brassicaceae	Senafich	D	cultivated	H
10.	*Brucea antidysenterica* Fresen.	Simaroubaceae	Waginos	DF	wild	Sh
11.	*Buddleja polystachya* Fresen.	Loganiaceae	Anfar	F	Both	Sh
12.	*Calpurnia aurea* (Ait.) Benth.	Fabaceae	Digita	DF	wild	Sh
13.	*Capsicum annuum* L.	Solanaceae	Berbere	D	cultivated	H
14.	*Carica papaya* L.	Caricaceae	Papaya	F	cultivated	T
15.	*Carissa spinarum* L.	Apocynaceae	Agam	DF	wild	Sh
16.	*Citrus limon* (L.) Burm.f.	Rutaceae	Lomi	F	cultivated	Sh
17.	*Clematis simensis* Fresen.	Ranunculaceae	Azo hareg	DF	wild	Cl
18.	*Clerodendrum myricoides* (Hochst.) Vatke	Lamiaceae	Misirich	DF	wild	Sh
19.	*Clutia abyssinica* Jaub. & Spach	Euphorbiaceae	Fiyalefaj	F	wild	H
20.	*Coffea Arabica* L.	Rubiaceae	Buna	D	cultivated	Sh
21.	*Cordia africana* Lam.	Boraginaceae	Wanza	D	wild	T
22.	*Coriandrum sativum* L.	Apiaceae	Denbelal	D	cultivated	H
23.	*Croton macrostchyus* Del.	Euphorbiaceae	Bisana	DF	wild	T
24.	*Cucumis ficifolius* A.Rich.	Cucurbitaceae	Ye medir enbuay	F	wild	Cl
25.	*Cucurbita pepo* L.	Cucurbitaceae	Duba	D	cultivated	Cl
26.	*Cupresses lusitanica* Mill.	Cupressaceae	Yeferenj tsid	F	Both	T
27.	*Cynoglossum coeruleum*(Hochst.ex.A.rich.)	Boraginaceae	Chigogit	F	wild	H
28.	*Cyphostemma adenocaule* (Steud. exA. Rich.)Des. ex Wild &Drum.	Vitaceae	Aserkush	F	wild	Cl
29.	*Datura stramonium* L.	Solanaceae	Astanagir	F	wild	H
30.	*Discopodium penninervum* Hochst.	Solanaceae	Almit	F	wild	Sh
31.	*Dodonaea angustifolia* L.	Sapindaceae	Kitkita	DF	wild	Sh
32.	*Dombeya torrida* (J. F. Gmel.) P. Bamps	Sterculiaceae	Wulkifa	DF	wild	T
33.	*Dovyalis abyssinica* (A.Rich.)Warb.	Flacourtiaceae	Koshim	F	Both	Sh
34.	Echinops kebericho Mesfin	Asteraceae	Kerebicho	D	wild	H
35.	*Embelia schimperi* Vatke	Myrsinaceae	Enkoko	DF	wild	Sh
36.	*Erica arborea* L.	Ericaceae	Asta	DF	wild	T
37.	*Eucalyptus globulus* Labill.	Myrtaceae	Nech bahirzaf	DF	cultivated	T
38.	*Euphorbia abyssinica.* Gmel	Euphorbiacea	Kulkual	DF	wild	T

39.	*Guizotia abyssinica* L.	Asteraceae	Nug	D	cultivated	H
40.	*Hagenia abyssinica* (Bruce) J. F. Gmel.	Rosaceae	Koso	DF	wild	T
41.	*Hypericum revolutum* Vahl	Hypericaceae	Amja	DF	wild	Sh
42.	*Jasminum abyssinicum* L.	Oleaceae	Tembelel	F	wild	Cl
43.	*Juniperus procera* Endl.	Cupressaceae	Ye abesha tsid	DF	wild	T
44.	*Justicia schimperiana* (Hochst. exNees) T. Anders	Acanthaceae	Simiza sensel	F	wild	Sh
45.	*Kalanchoe petitiana* A. Rich.	Euphorbiaceae	Endawula	F	wild	H
46.	*Kosteletzkya begonifolia* Ulbr.	Malvaceae	Yemegerem	F	wild	H
47.	*Linum usitatissimum* L.	Lineaceae	Telba	D	cultivated	H
48.	*Lobelia rhynchopetalum* Hemsl.	Lobeliaceae	Jibira	D	wild	Sh
49.	*Lepidium sativum* L.	Brassicaceae	Feto	D	cultivated	H
50.	*Maesa lanceolata* Forssk.	Myrsinaceae	Shwaria(kelawa)	DF	wild	Sh
51.	*Melia azedarach* Forssk.	Meliaceae	Nim	DF	cultivated	T
52.	*Myrtus communis* L.	Myrtaceae	Ades	D	wild	Sh
53.	*Nicotiana tabacum* L.	Solanaceae	Timbaho	DF	cultivated	H
54.	*Nigella sativa* L.	Ranunculaceae	Tikur azmud	D	cultivated	H
55.	*Ocimum basilicum* L.	Lamiaceae	Zikakibe	F	cultivate	H
56.	*Ocimum lamiifolium* Hochst. ex Benth.	Lamiaceae	Damakese	F	Both	Sh
57.	*Olea europaea L. subsp. cuspidate*(Wall. ex G. Don) Cif.	Oleaceae	Weyra	DF	wild	T
58.	*Opuntia ficus-indica* (L.) Miller	Cactaceae	Balas(Ashewa kulkual)	F	wild	Sh
59.	*Otostegia integrifolia* Benth.	Lamiaceae	Tunjit	D	wild	Sh
60.	*Osyris quadripartita* Decn.	Santalaceae	Keret	F	wild	Sh
61.	*Phytolacca dodecandra* L' Herit.	Phytolaccaceae	Endod	F	wild	Sh
62.	*Pittosporum viridiflorum* Sims	Pittosporaceae	Tebera	F	wild	T
63.	*Plantago lanceolata* L.	Plantaginaceae	Gortab (Wenberet)	F	wild	H
64.	*Prunus persica* (L.) Batsch	Rosaceae	Kok	F	cultivated	T
65.	*Pterolobium stellatum* (Fors)Brenan	Fabaceae	Kentafa	DF	wild	Sh
66.	*Rhamnus prinoides* L. Herit.	Rhamnaceae	Gesho	F	cultivated	Sh
67.	*Ricinus communis* L.	Euphorbiaceae	Gulo	DF	cultivated	Sh
68.	*Rosa abyysinica* Lindley	Rosaceae	Kega	F	wild	Sh
69.	*Rumex abyssinicus* Jacq.	Polygonaceae	Makmako	DF	wild	H
70.	*Rumex nepalensis* Spreng.	Polygonaceae	Lut	F	wild	H
71.	*Rumex nervosus* Vahl	Polygonaceae	Embacho	DF	wild	Sh
72.	*Ruta chalepensis* L.	Rutaceae	Tenadam	DF	cultivated	H
73.	*Salix macronata* Thunb.	Salicaceae	Lahaya	F	wild	T
74.	*Schinus molle L.*	Anacardiaceae	Kundoberbere	DF	cultivated	T
75.	*Sesamum indicum* L.	Pedaliaceae	Selit	D	cultivated	H
76.	*Sida schimperiana* Hochst. Ex A. Rich.	Malvaceae	Cifrig	DF	wild	H
77.	*Solanum adoense* (Hochst) ex A. Rich.	Solanaceae	Zerch Enbuay	DF	wild	Sh
78.	*Solanum incanum* L.	Solanaceae	Enbuay	DF	wild	Sh
79.	*Solanecio gigas* (Vatke.)C. Jeffery	Asteraceae	Yeshikoko gomen (Mogne qitel)	F	wild	Sh
80.	*Stephania abyssinica*(Dillo&A.Rich.)Walp.	Menispermacae	Ye ayit hareg (Chewchawit)	F	wild	Cl
81.	*Syzgium aromaticum* L.	Myrtaceae	Kirunfu	D	cultivated	T
82.	*Tanacetum cinerariifolium* (Trev). Sch.	Asteraceae	Kaba	F	wild	H

	Bip.					
83.	*Trigonella foenum-Graecum* L.	Fabaceae	Abish	D	cultivated	H
84.	*Thymus schimperi* Ronniger	Lamiaceae	Tosign	DF	wild	H
85.	*Urera hypselodendron* (A. Rich.) Wedd.	Urticaceae	Lankuso	F	wild	Cl
86.	*Urtica simensis* Steudel	Urticaceae	Sama	F	wild	H
87.	*Verbena officinalis* L.	Verbenaceae	Atuch	F	wild	H
88.	*Verbascum sinaiticum* Benth.	Scrophulariaceae	Kutina(ye Ahya joro)	DF	wild	H
89.	*Vernonia amygdalina* Del.	Asteraceae	Gerawa	F	Both	T
90.	*Vernonia hymenolepis* A.Rich.	Asteraceae	Weynagift	F		Sh
91.	*Zehneria scabra* (Linn.f.) Sond.	Cucurbitaceae	Haregresa(Etse sabeq(NechHareg)	F	wild	Cl
92.	*Zingiber officinale Roscoe*	Zingiberaceae	Jinjible	F	cultivated	H
93.	*Ziziphus spina- christi* (L.) Desf.	Rhamnaceae	Gaba	F	Both	Sh

Appendix 2: List of medicinal plants used for both human (Hu) and livestock (Li) ailment treatment: scientific name; family; local name (A=Amharic; O=Afan Oromo) habit; parts used; disease treated; methods of preparation with dosage used and route of application.

Key: Habit (Ha.): Herb (H) ;Shrub (Sh) ; Tree(T); Climber (Cl.); Epiphyte (Ep.); Parts used (Bark, B; Latex, La; Root, R; Leaf, L; Fruit, Fu.; Flower, Fw.; Seed, Se.;Stem,St.;Sap,Sa; Bulb, Bu.; Root and leaf, LR.; Above ground , Ag; Leaf and seed, LSe; shoot, Sht.

Scientific name	Family	Local name	Ha	Pu	Used for	Disease treated	Mode of preparation
Acacia abyssinica Hochst. ex Benth.	Fabaceae	Girar (A) Laaftoo(O)	T	Sht	Hu	Tonsillitis	Fresh shoot is chewed and the juice i swallowed.
				Sht	Hu	Wound	Fresh shoot is pounded, squeezed and the sap i creamed on affected part
Achyranthes aspera L.	Amaranthaceae	Talenj(A) Darguu(O)	H	L	Both	Pneumonia	Freshleafare pounded, mixed with water an drunk in the Morning.
				L	Hu	Body swelling	Leaf is squeezed and creamed on swollen body.
				L	Hu	Wound	Leaves are pounded and tied on the wound.
				L	Hu	Nasal bleeding	Fresh leaf of *Achyranthes aspera* is squeeze and its juice is dropped in to the nostrils to sto bleeding.
				R	Hu	Stomach-ache	The root of *Achyranthes aspera* is chewed an swallowed during feeling of ache.
Allium cepa L.	Alliaceae	Qey shenkurt(A) Qullubbii Diimaa(O)	H	Bu	Li	Leech	Fresh bulb is pounded, mixed with little wate decanted and poured through the nose.
					Hu	Asthma	Fresh bulb of *Allium cepa* is crushed wit *Zingiber officinale* rhizome and boiled. The drink the solution in the morning until recovery.
Allium sativum L.	Alliaceae	Nech shinkurt(A) Qullubbii adii(O)	H	Bu	Hu	Malaria	Fresh bulb of *Allium sativum* and rhizome o *Zinger officinale* are pounded together, mixe with honey and eaten.
				Bu	Hu	Evil eye	Bulb of *Allium sativum* is crushed together wit rhizome of *Zingiber officinale* and *Lepidiu sativum*, pasted with honey and 2 tea spoons i taken.
				Bu	Hu	Colds	The Bulb is pounded, mixed with honey and 2- teaspoon is eaten every day for three days.
Aloe pubescens Reynolds	Aloaceae	Eret (A) Argiisa(O)	H	La	Hu	Fire burn	The latex is painted on the wound
				La	Hu	Ringworm	The latex of the young leaves is creamed on th affected area and repeated every day unti recovery.
				La	Li	anthrax	Root of *Aloe pubescens* is crushed and mixe with cold water. Then two cup of tella is give to cattle.
Artemisia abyssinica Sch. Bip.ex A. Rich.	Asteraceae	Harit(A) Harrittaa(O)	H	L	Hu	Evil eye	Leaf concoction together with root of *Echinop kebericho* is added to a burning fire and smoke to the patient.
				L	Hu	Malaria	Fresh leaf is crushed and pounded with wate filtered and drunk until recovery.
				L	Hu	Child Stomach-	Leaf is squeezed and ¼ of coffee cup juice i given to children

						ache	
Asparagus africanus Lam.	Asparagaceae	Yesetkest(A) Sariitii(O)	Cl	R	Hu	Retained placenta	Fresh root is pounded; mixed with water and boiled, decanted, mixed with honey and drunk
				R	Hu	Wound	Fresh root is pounded together with leaves o *Dodonea angustifolia*, mixed with butter and creamed on the wound.
				L	Hu	Malaria	Leaf is smashed, mixed with water and decanted, then mixed with milk and one coffe cup is taken every morning.
				L	Li	Bloating	Leaves of *Asparagus africanus*& the root o *Verbasicum sinaiticum* are pounded and mixed with water, decanted and dropped in to lef nostril.
Brassica carinata A.Br.	Brassicaceae	Gomenzer (A) Ija raafuu(O)	H	Se	Hu	Stomach problem	Crushed and eaten with *Allium sativum* by adding salt.
				Se	Hu	Cancer	The seed of *Brassica carinata* together with seed of *Ricinus communis* is crushed, powdered and mixed with honey and then creamed on affected part.
Brassica nigra L.	Brassicaceae	Senafich(A) Sanaafica(O)	H	Se	Hu	Malaria	Powdered seed of *Brassica nigra*, chopped *Allium sativum* and *Cicer arietinum* seed (Shimbura) are soaked with water and eaten afte one day by enjera in the morning.
				Se	Hu	Intestinal parasites Amoeba	The semi-liquid condiment made of *Brassica nigra* called (awaze) is eaten with either injera or germinated bean seeds.
Brucea antidysenterica Fresen.	Simaroubaceae	Waginos (Abalo(A) Qomanyoo	Sh	L	Li	External parasites (lice)	Leaf of *Brucea antidysenterica* is pounded and mixed with water. The mixture is used to wash skin of cattle, donkey, mule and horse.

		(O)					
				L	Hu	Wound and itches	Dried leaf of *Brucea antidysenterica* i pounded, mixed with butter and creamed th affected part until recovery.
				R	Hu	Evil eye	Dried root of *Brucea antidysenterica* an *Carissa spinarum* are mixed together, smoke & inhaled.
				Se	Hu	Back pain	Seed of *Brucea antidysenterica* is boiled wit milk and drunk for 3-4 consecutive days.
Buddleja polystachya Fresen.	Loganiaceae	Anfar(A) Adaaddii(O) Hanfaaree(O)	Sh	L	Li	Eye disease	Fresh Leaf of *Buddleja polystachya* is chewe and spitted on cattle eye.
				L	Hu	Wound	Fresh leaf of *Buddleja Polystachya* is pounded powdered and applied on wound
Calpurnia aurea (Ait.) Benth.	Fabaceae	Digita(A) Ceekaa (O)	Sh	L	Hu	Wound	Dried leaf of *Calpurnia aurea* is pounded mixed with butter or honey and creamed on th wounded part.
				L	Li	Scabies and Lice	Leaf of *Calpurnia aurea*, *Croton macrostachyu* and *Justicia schimperiana* are pounded, mixe with water and wash the body of the cattle ever morning until the Scabies (itches) and parasite are eradicated.
				L	Both	Snake bite	Leaf of *Calpurnia aurea* is squeezed and dro of the sap is given orally to cattle and to Human
				L	Hu	Diarrhea	Fresh leaf of *Calpurnia aurea* is squeezed an the juice is drunk before breakfast.

Capsicum Annuum L.	Solanaceae	Berbere (A) Qaaraa(O)	H	Fu/ Se	Hu	Skin rash	Fruit and seed of *Capsicum annuum* is pounded, powdered, mixed with butter and creamed the infected parts
					Hu	Tonsillitis	Fruit and seed of *Capsicum annuum* is pounded, powdered, mixed with oil, roasted and drunk
Carica papaya L.	Caricaceae	Papaya (A) Pappayya(O)	T	Fu	Hu	Heart problem	Fruit is eaten
				L	Hu	malaria	Leaf of *Carica papaya* and *Allium sativum* bull are pounded together and made in the form o soup, boiled and mixed with honey and two cu are drunk.
				L	Hu	Intestinal parasites	Fresh leaves are boiled with water and coole then drunk in the morning.
Carissa spinarum L.	Apocynaceae	Agam(A) Agamsa(O)	Sh	R	Hu	Evil eye	Root of *Asparagus africanus*, root, *Lobelia rhynchopetalum* bark, *Artemisia abyssinica* roo and leaf, *Allium sativum* and *Ruta chalepensi* are crushed and smashed together and rolled by piece of cloth and tied on neck or arm.
				L	Hu	Head ache	Dried Leaf of *Carissa spinarum* is pounded and the smoke is used as treatment for head ache.
				L	Hu	Stomach-ache	Leaf of *Carissa spinarum* is Pounded, mixed with honey. Two-three spoon is taken early in the morning before breakfast.
				L	Hu	Malaria	Fresh root is pounded, mixed with cold water decanted and drunk after one day.

Citrus limon (L.) Burm.f.	Rutaceae	Lomi (A) Loomii (O)	Sh	L	Hu	Cough	The leaf of *Citrus limon* is pounded, powdered mixed with milk, boiled and sugar is added Then drink pure liquid during feeling of th pain.
				Fu	Hu	Athlete's foot	Fruit of *Citrus limon* is squeezed and creame on affected part for continuous days.
				Fu	Hu	Scabies(itches)	Fruit juice is squeezed and applied to th affected part.
				Fu	Hu	Vomit	Fresh fruits are squeezed and the juice is drunk
Clematis simensis Fresen.	Ranunculaceae	Azo hareg(A) Hidda feetii(O)	Cl	L	Hu	Cancer	Fresh leaf is crushed, smashed, rolled by clea cloth and tied on hand.
					Li	Horse itch	Leaf of *Clematis simensis* is squeezed an dropped on itched part.
				R/L	Hu	Tonsillitis	Leaf of *Clematis simensis* is crushed, rolled i clean cloth and tied on neck.
				R/L	Hu	Wound	Dried root and leaf of *Clematis simensis* ar pounded, powdered, mixed with butter an creamed on affected part.
Clerodendrum myricoides (Hochst.) Vatke	Lamiaceae	Misirich(A) Maraasisaa (O)	Sh	R	Hu	Stomach-ache	Root of *Clerodendrum myricoides*, fruit o *Croton macrostchyus* and root of *Solanum adoense* are crushed together and mixed wit rotten butter and drunk.
				R	Hu	Headache	Root latex of *Clerodendrum myricoides* is drie powdered, mixed with butter and creamed o head
				R	Hu	Evil eye	Dried root is crushed and put on broken pot, an then fire is added to it and fumigated.
				L	Hu	Eye problems	Leaves are pounded and powdered then sprayed to the eye.
Clutia abyssinica Jaub. & Spach	Euphorbiaceae	Fiyalefaj (A) Ulee loonii(O)	H	Se	Hu	Ring worm	Fresh seed is smashed, mixed with butter an creamed on affected part.
				L	Hu	Ear disease	Leaf of *Clutia abyssinica* is pounded, squeeze and then its drop is added through the ear.
				R	Hu	Toothache	Fresh root is chewed and kept on teeth for som times.
Coffea Arabica L.	Rubiaceae	Buna(A) Buna(O)	Sh	Se	Hu	Diarrhea	Powder of roasted coffee bean is mixed wit butter and eaten or drunk before breakfast for 3 4 days.
					Hu	Fire burn	Seed of *Coffea arabica* is roasted, pounded powdered and applied on affected part.
					Hu	Spider poison	Seed of *Coffea arabica* is Roasted, powdered mixed with butter and painted.
					Hu	Eye disease	Roasted seeds of *Coffea Arabica* is pounde together with Leaf of *Trigonella foenum graecum*, mixed with butter and rubbed on th external eye.
Cordia africana Lam.	Boraginaceae	Wanza(A) Waddeessa (O)	T	B	Hu	Unstopped menstruation	Fresh bark is pounded, mixed with water decanted and drunk with one coffee cup fo three consecutive days

				L	Hu	Toothache	Fresh leaf is chopped, chewed with salt and the juice is swallowed.
				Fu	Hu	Intestinal parasites	The Fruit is eaten as food for the case o Intestinal parasites in the morning before food for 4-5 consecutive days.
Coriandrum sativum L.	Apiaceae	Denbelal(A) Dinbilaala(O)	H	Se	Hu	Cough	The seed together with butter and small quantity of water are boiled and drunk.
					Hu	Wound	Leaf of *Coriandrum sativum* is pounded with leaf of *Croton macrostachyus* and *Rumex nervosus*. Then creamed on wounded part for 2 3 days.
Croton macrostchyus Del.	Euphorbiaceae	Bisana (A) Bakkannisa (O)	T	Sht	Hu	Gonorrhea	Seven, nine or eleven shoot tips is cut, cooked together with *Ruta chalepensis* and one spoonful of the solution is drunk per a day for seven consecutive days.
				B	Li	Bloating	The bark of root is ground, mixed with water and given to the animal.
				L	Li	Scabies(itches)	Leaf of *Croton macrostachyus* with leaf of *Brucea antidysenterica* are crushed together and used as skin wash for calf.
Cucumis ficifolius A.Rich.	Cucurbitaceae	Midir enbuay(A) Coolotoo(Hiddii hooloo(O)	Cl	R	Hu	Gonorrhea	Root of *Cucumis ficifolius* and root of *Cyphostemma adenocaule* are crushed and pounded together, mixed with water and decanted, then mixed with honey and drunk.
				R	Li	Cattle infection	Root of *Cucumis ficifolius* with leaf of *Vernonia amygdalina* are pounded together and mixed with cold water. Then given to cattle by tella material (merti).
				Fu	Hu	Stomach-ache	The root of *Cucumis ficifolius* is chewed and swallowed during the feeling of ache
				Sa	Hu	Ear pain	Sap of fruit is added to ear canal.
Cucurbita pepo L.	Cucurbitaceae	Duba (A) Dabaaqula (O)	Cl	Se	Hu	Tape worm	Seed of *Cucurbita pepo* is roasted and eaten before breakfast.
Cupresses lusitanica Mill.	Cupressaceae	YeFerenj tsid(A) Gaattiraa faranjii(O)	T	La	Hu	Ringworm	Latex of *Cupresses lusitanica* is creamed on affected part of body.
Cynoglossum	Boraginace	Chigogit(A	H	L	Hu	Headache	Fresh leaf of *Cynoglossum coeruleum* i

coeruleum (Hochst.ex.A.rich.)	ae	) Maxxannee (O)					massaged and sniffed.
				R		Body swelling	Fresh root of *Cynoglossum coeruleum* i chewed and sprayed on swollen part
				L		Scabies(Itches)	Juice of fresh leaves is applied on the skin.
Cyphostemma adenocaule (Steud. ex A. Rich.) Des. ex Wild & Drum.	Vitaceae	Aserkush(A) Hidda Bofaa(O)	Cl	Tu	Hu	starvation	Tuber is cooked and eaten during famine
				Ag	Li	Infection on Neck(livestock)	Tied on the livestock's neck.
Datura stramonium L.	Solanaceae	Astanagir(A) Manjii (O)	H	L	Hu	Dandruff	Leaf is crushed with leaf of *Myrtus communis &* the powder is rubbed over the head after having cut the hair.
				R	Hu	Headache	Roots of *Datura stramonium* is pounded with leaf of *Ocimum gratissimum* and sniffed Nasally.
				Fu	Hu	Scabies(itches)	About 2-3 spoons of Powdered fruit of *Datura stramonium* is mixed with butter and creamed.
				L	Hu	Wound	Fresh leaf of *Datura stramonium* is squeezed and creamed the affeacted (wounded) part of the body.
Discopodium penninervum Hochst.	Solanaceae	Almit(a)	Sh	L	Li	Leech	The leaf of *Dispcopodium penninervum* i pounded, mixed with little water and the decanted is given to cattle.
					Li	Bloating	The fresh leaf of *Dispcopodium penninervum* i pounded, squeezed, mixed with water, decanted and given to cattle.
Dodonaea angustifolia L.	Sapindaceae	Kitkita(A) Ittacha(O)	Sh	L	Hu	Diarrhea	Fresh leaves are pounded, mixed with water decanted and drunk.
					Hu	Skin rash	Fresh leaves are crushed, mixed with water and painted the skin.
					Li	Wound	Dried leaves of *Dodonaea angustifolia* are powdered and sprayed on the wound of pack (domesticated) animals.
						Ecto-parasities	Fresh leafs are crushed and pounded with water then leaf extract is given Orally and pounded leaves are painted on the cattle body.
Dombeya torrida (J. F. Gmel.) P. Bamps	Sterculiaceae	Wulkifa (A) Daannisa(	T	L	Hu	Fire burn	Fresh leaf of *Dombeya torrida* is squeezed and creamed on affected part.

		O)					
						Abdominal pain	Dried leaf powder is mixed with honey and given Orally.
Dovyalis abyssinica (A.Rich.)Warb.	Flacourtiaceae	Koshim(A) Koshommii (O)	Sh	Fu	Hu	Intestinal Parasites	Its fruit is eaten as food for the case of intestinal parasite before breakfast every morning
*Echinops kebericho*Mesfin	Asteraceae	Kerebicho (A) Qarabichoo (O)	H	R	Hu	Evil eye	Root concoction together with Leaf of *Artemisia abyssinica* is added to a burning fire and smoked to the patient.
				R	Hu	Rabies	Root concoction together with root of *Ricinus communis* is boiled and decoction is drunk.
				R	Hu	Evil Spirit	Root is Crushed, heated on fire and its smoke is inhaled.
				R	Hu	Tetanus	Root of *E. kebericho* with bark of *Croton macrostachys* is pounded, powdered together mixed with honey and then one cup of the mixture is taken for 3 days.
Embelia schimperi Vatke	Myrsinaceae	Enkoko (A) Haanquu (O)	Sh	Se	Hu	Tape worm	Seed of *Embelia schimperi* is dried and powdered, mixed with water, two glasses are taken in the morning before food and stay for 6-7 hours.
				Fu	Hu	Epilepsy	Fruit of *Embelia schimperi* with seed of *Guizotia abyssinica* is crushed, powdered mixed with local alcohol "tej"and drunk
Erica arborea L.	Ericaceae	Asta(A) Maxaxee (O)	T	Sht	Hu	Giardiasis	Shoot is boiled and the decoction is drunk for 3-4 days consecutively.
				L	Hu	Wound	The powder of dried leaves is mixed with butter & rubbed on the affected part.
Eucalyptus globulus Labill.	Myrtaceae	Nech	T	L	Hu	Influenza	The Leaf of *Eucalyptus globulus* is chopped and Boiled with water and inhale the vapo

		bahirzaf(A) Bargamoo adii(O)					repeatedly.
				St	Hu	Fibril illness	The young leaves and immature stem tip ar boiled in water and the steam is inhaled by th patient during the sleep time until recovery.
				L	Hu	Malaria	Dried leaf is put on fire and smoked
				L	Hu	Cough	Leaf is boiled with sugar and one tea cup o syrup is drunk.
Euphorbia abyssinica. Gmel	Euphorbiaceae	Kulkual (A) Adaammii (A)	T	Fw	Hu	Wound	Fresh flower of *Euphorbia abyssinica* i squeezed and creamed on affected part
				B	Hu	Ascariasis	Fine powder of pounded bark o *Euphorbiaabyssinica* and *Croto macrostachyus* is mixed with water, decante and taken at meal time.
				La	Hu	Gonerrhea	Very small amount of the milky latex is mixe with red teff flour, baked and eaten for thre consecutive days.
Guizotia abyssinica L.	Asteraceae	Nug(A) Nuugii(O)	H	Se	Hu	Kidney Problem	Seed of *Guizotia abyssinica* is roasted, pounde and mixed with powdered leaves of *Thymu schimperi* and boiled. Then one coffee cup i drunk for 3-5 days.
				Se	Hu	Swelling	Seed is roasted, pounded and powdered, the boiled with salt and the syrup is drunk.
				Se	Li	Leech	More than one litter powdered seed mixed wit water is given to cattles for three day continuously.
Hagenia abyssinica (Bruce) J. F. Gmel.	Rosaceae	Koso (A) Heexoo(O)	T	Fu	Hu	stomach-ache	Fresh fruit is crushed, squeezed and the juice i mixed with tella and drunk.
				Se	Hu	Venereal disease (abalazar)	Dried Seed is powdered, mixed with tela an drunk.
				Se	Hu	Eczema	Calf horn and *roasted Hagenia abyssinica* see are pounded together, mixed with butter an creamed on affected body part.

				Se	Hu	Tape worm	The seed of *Hagenia abyssinica* is crushed powdered, mixed with milk, boiled and drunk for five days before breakfast.
Hypericum revolutum Vahl	Hypericaceae	Amja (A) Muka Foonii(O)	Sh	L	Hu	Erythroblasts	Leaf is boiled with water and the decoction is drunk.
				Sht	Hu	Dandruff	Shoot is crushed, squeezed and the sap is creamed after having cut hair.
				L/R	Li	Rabies	The root and leaf of *Hypericum revolutum* together with roots of Rumex nervosus *Phytolacca dodecandra, Bruce antidysenterica*, leaf and bark of *Croton macrostachyus* are pounded together, mixed with water and given to cattle.
Jasminum abyssinicum L.	Oleaceae	Tembelel Biluu(O)	Cl	L	Hu	Eye disease	The leaves of *Jusminium abysinicum* and seven pieces of immature stems of *Olea europaea* are ground and powdered together, mixed with water and drop of mixture is applied on infected part for 3 days.
Juniperus procera Endl.	Cupressaceae	Ye abesha tsid(A) Gaattiraa(O)	T	B	Hu	Tonsillitis	Fresh stem bark is chewed and the juice is swallowed.
				B	Hu	Malaria	Dried bark is boiled with water and the decoction is drunk.
				L	Hu	Pneumonia	Fresh leaf is Crushed and steeped in cold water and the infusion is drunk.
Justicia schimperiana (Hochst. exNees) T. Anders	Acanthaceae	Simiza(sensel)(A) DHummuugaa(O)	Sh	L	Li	Hen disease (Cocoidiosis)	The leaf (shoot) is crushed, mixed with water and decanted; 'Enjera' (bread) is soaked with the solution and given to the hen.
				L/R	Li	Blackleg	Leaf and root of *Justica schimperiana* is pounded with dried fruit *of Ricinus communis* and the solution is given to cattle.
				L	Hu	Leg swelling	Fresh Leaf is heated on fire; salt is added to it and tied on the swollen part.
				L	Li	Lice	Leaf of *Justicia schimperiana* with leaf of *Calpurina aurea* are used to wash the body of cattle to remove the lice.
Kalanchoe petitiana A. Rich.	Euphorbiaceae	Endawula (A) Bosoqqee (O)	H	R	Hu	Bone fracture	Fresh leaf is squeezed; the juice is mixed with butter and applied topically on fractured part.
				L	Hu	wound	Fresh leaf is heated with fire, squeezed and the juice is dropped on wounded part

				R	Hu	Ear disease	Fresh root of *Kalanchoe petitiana* is squeezed and few drops are added through ear canal.
Kosteletzkya begonifolia Ulbr.	Malvaceae	Yemegeremm (A)	H	R	Li	For anthrax	Fresh leaf of *Kosteletzka begonifolia* is pounded squeezed mixed with"tella" and drunk.
					Hu	For body swelling	
Linum usitatissimum L.	Lineaceae	Telba(A) Talbaa(O)	H	Se	Hu	Wound	Seed of *Linum usitatissimum* is pounded, mixed with honey and creamed on wounded part
				Se	Li	Retained placenta	Seed of *Linum usitatissimum* is powdered and half of a glass of the powder is dissolved in water and given to cattle.
				Se	Hu	Amoeba	The pounded seed is mixed with water and drunk before breakfast.
				Se	Hu	Gastritis	The seed of *Linum usitatissimum* is pounded mixed water and sugar and then drunk during feeling the pain.
Lobelia rhynchopetalum Hemsl.	Lobeliaceae	Jibira(A)	Sh	B and R	Hu	Evil eye	The bark and root of *Lobelia rhynchopetalum* is crushed , mixed with little water and sniffed at the sickness time or the dried root is tied with piece of cloth around the neck or put it in the pocket.
				R	Hu	Scabies(itches)	Root of *Lobelia rhynchopetalum* is dried powdered, mixed with butter, rub the body for some days and finally taking a shower at the end of the day.
Lepidium sativum L.	Brassicaceae	Feto(A) Feecoo(O)	H	Se	Hu	Bloating	Seed of *Lepidium sativum* and bulb of *Allium sativum* are pounded together, mixed with water and given to cattle.
				Se	Hu	Dysentery	The seed of *Lepidium sativum* is ground, mixed with milk, then filtrate and the solution is drunk
				Se	Hu	Malaria	Seed of *Lepidium sativum*, bulb of *Allium sativum* and rhizome of *Zingiber officinale* are pounded together and given to Human with honey.
				Se	Hu	Tonsilitis	Seed of *Lepidium sativum* and bulb of *Allium sativum* are pounded together and given to Human with honey.

				Se	Hu	Fibril illness	Dried seeds are powdered and added in to fir and smoked to the patient.
				St	Hu	Hemorrhoids	Stem is heated on fire and used to burn th affected part
Maesa lanceolata Forssk.	Myrsinaceae	Shwaria(kelawa) (A) Abbayyii (O)	Sh	L and Se	Li	For leeches	Dried leaf and fruit of *Maesa lanceolata* ar crushed, pounded and the powder is added t water to kill leeches
				R	Li	Retention of placenta	Root of *Maesa lanceolata* is boiled with seed o *Linum usitatissimum* and given to cattle.
				L	Hu	Eczema(chife)	Dried leaf powder together with the powder o leaf of *Croton macrosrachyus* are pasted wit butter and applied for seven days consecutively.
Melia azedarach Forssk.	Meliaceae	Nim(A) Niimii(O)	T	L	Hu	Malaria	Chewing and swallowing the juice of fresh leaf.
				B	Li	Anthrax	The fine powder of dried bark is added to glass of water and applied through the mouth.
				Sht	Hu	Tooth ache	Young shoot tip is chewed and kept on th teeth.
Myrtus communis L.	Myrtaceae	Ades(A) Adasii(O)	Sh	L	Both	Intestinal parasites	Dried leaf of *Myrtus communis* is pounded added to tella and drunk to expel intestina parasites.
				L	Hu	Dandruff	The leaf of *Myrtus communis* is powdered mixed with butter and creamed on head after i cut.
				L	Hu	Scabies(itche s)	Dried powder is mixed with butter & applied o the affected part
Nicotiana tabacum L.	Solanaceae .	Timbaho(A) Tamboo(O)	H	L	Hu	Snake bite	Leaf of *Nicotiana tabacum* is crushed an squeezed, mixed with water and the Juice i drunk to expel the poison by vomiting.
				L	Li	Bloating	Leaf and root of *Nicotiana tabacum* is dried powdered, mixed with salt, water and made a bread. Slice is given to cattle before they drin water for three days.
				St/ L	Li	Leech	The young stems and or leaf is ground, add salt and then one glass of the mixture is given every morning for three days orally or through th nose.
				L	Li	Internal parasites	Leaf of *Nicotiana tabacum* is pounded with roo of *Carissa spinarum* and mixed with water. On merit solution is given to calf.

Nigella sativa L.	Ranunculaceae	Tikur azmud(A) Abasuuda gurraacha (O)	H	Se	Hu	Depression	Seed is added to tea and drunk to stimulate mental.
				Se	Hu	Tonsillitis	Seed of *Nigella sativa* is pounded, powdered and added to coffee. Then drunk for 3-4 consecutive days.
				Se	Hu	Stomach-ache	Seed is crushed and pounded with *Ruta chalepensis, Lepidium sativum* and *Allium sativum* then mixed with honey and a spoonful of the mixture is taken before breakfast.
Ocimum basilicum L.	Lamiaceae	Zikakibe(A) Gosobila(O)	H	L	Hu	Headache	Leaf of *Ocimum basilicum* is crushed and sniffed.
				L	Hu	Malaria	Leaf of *Ocimum basilicum* and bulb of *Allium sativum* are pounded together and eaten with honey in the morning.
				L	Li	Bloating	Its fresh leaves with the bulb of *Allium sativum* and salt are ground together and then one litter of the solution is given to cattle.
Ocimum lamiifolium Hochst. ex Benth.	Lamiaceae	Damakese(A) Damakasee (O)	Sh	L	Hu	Febrile illness	Fresh leaf of *Ocimum lamiifolium* together with leaf of *Eucalyptus globulus*, is pounded, mixed with water and drunk or the patient can inhale the vapor of the boiled mixture.
				L	Hu	Headache	Leaf of *Ocimum lamiifolium* is massaged and sniffed.
Olea europaea L. subsp. cuspidata (Wall. ex G. Don) Cif.	Oleaceae	Weyra(A) Ejersa(O)	T	L	Both	Eye disease	Leaf is Crushed and squeezed. Then the sap is dropped by piece of clean cloth on eye.
				St	Hu	Wound	Fresh stem is heated on fire and the oily liquid produced from the stem is applied on the wound.
				St	Hu	Gastiritis	Oily liquid produced from the stem is drunk after meal for three consecutive days.
				B	Hu	Haemorrhoid	The bark is heated on fire and held on the pain area.
Opuntia ficus-indica (L.) Miller	Cactaceae	Balas(	Sh	L	Hu	Ear disease	Leaf of *Opuntia ficus-indica* is squeezed and the sap is dropped through ear canal safely.

		Ashewa kulkual(A) Adaammmmi i(O)		Fu	Hu	Stomach-ache	Ripened fruit is eaten
Otostegia integrifolia Benth.	Lamiaceae	Tunjit(A) Xunjiitii(O	Sh	L	Hu	Stomach-ache	Leaf of *Otostegia integrifolia* and leaf o *Solanum adoense* are crushed, squeezed together and the juice or sap is drunk.
					Hu	Fibril illness	Dried leaf is added to fire and fumigated
					Hu	Tonsillitis	Fresh leaf of *Otostegia integrifolia* is squeezed and half of coffee cup is drunk
Osyris quadripartita Decn.	Santalaceae	Keret (A) Waatoo (O)	Sh	St	Hu	Stomach-ache	Fresh stem bark of is chewed & the solution i swallowed.
				L	Hu	Wound	Dried or fresh leaf of is crushed, powdered and then applied on the wound part
Phytolacca dodecandra L' Herit.	Phytolaccaceae	Endod(A) Handoodee (O	Sh	Se	Hu	To stop pregnancy	Seed of *Phytolacca dodecandra* are crushed smashed, squeezed and the juice is drunk.
						Malaria	Fresh root is smashed, mixed with water decanted and drunk in the morning.
				R	Li	Bilharziha	Fresh root is chewed and swallowed.
						Stomach-ache	Fresh root is crushed and pounded with water then filtered and drunk for four days

Pittosporum viridiflorum Sims	Pittosporaceae	Tebera(A) Dambii(O)	T	L	Hu	Dandruff	Leaf is crushed, smashed and mixed with butte and creamed after having cut hair.
Plantago lanceolata L.	Plantaginaceae	Gortab Ye wusha milas Wenberet(A) Qorxobbii (O	H	L	Hu	Wound	Fresh leaf of *Plantago lanceolata* and bulb o *Allium sativum* are crushed, smashed togethe and rubbed on wounded part.
						Fibril illness	Rub the body with the squeezed leaves
						Skin cut	Fresh leaf of *Plantago lanceolata* is smashed squeezed and three to four drops of the exudat is added to skin cut.
Prunus persica (L.) Batsch	Rosaceae	Kok(A) Kookii (O)	T	L	Hu	Constipation	Fresh leaf of *Prunus persica* is crushed an mixed with water and given orally fo continuous days until it gets relieve.
				L	Hu	Diarrhea	Leaf is pounded, mixed with water an decanted, and then one cup of local tella i given to Human.
				Ep	Hu	For delayed pregnancyWoman(Infertile)	Leaf of epiphyte is cut by her Husband. Ther crushed, mixed with water, decanted, drunk a bed time and continuing sexual intercourse.
Pterolobium stellatum(Forsk)Brenan	Fabaceae	Kentafa(A) Harangamaa(O)	Sh	L	Hu	Goiter	Crush the leaves and mix with butter. Ther apply the paste and tie it on the neck.
				L	Hu	Evil eye	Leaf of *Pterolobium stellatem* and *Rut chalepensis* are pounded, mixed with water an one coffee cup is drunk.
				R	Hu	Sudden sickness	Root of *Pterolobium stellatem* is dried powdered and preserved. One spoon of th powder is mixed with alcohol and given t human.
Rhamnus prinoides L. Herit.	Rhamnaceae	Gesho(A) Geeshoo(O)	Sh	L	Hu	Teeth-ache	Leaf is chewed and kept on the teeth.
				L	Li	Leech	Leaf is crushed, dried and soaked with th leaves of a *Solanumtuberosum* at least for 2 days & then given small droplets through lef nostril & then much more through their mouth.

				L	Hu	Tonsillitis	Young leaves are chewed and the juice i swallowed.
Ricinus communis L.	Euphorbiaceae	Gulo(A) Qobboo(O)	Sh	Se	Hu	Headache	Seed is pounded, mixed with butter, and tied or head.
				Se	Li	Anthrax	Fresh Fruit is pounded, mixed with water and given for cattle to drink.
				Se	Hu	Impotency	Seeds are pounded, mixed with small quantity of Aloe spp. latex and drink one coffee cup before bed time for 3-4 days.
				L	Li	Bloating	Fresh leaf is pounded, mixed with water; salt i added and given to cattle Orally.
R*osa abyysinica* Lindley	Rosaceae	Kega(A) Goraa(O)	Sh	L	Hu	Ascariasis	Fresh leaf is pounded, mixed with water *and a cup of the mixture is drunk.*
				Fu		Hypertension	Fresh fruit with the leaves of *Otostegia integrifolia* are ground, powdered, mixed with water and one coffee cup is drunk during the sick time.
				Fw / L		Erythroblasts	The flower and leaf of *Rosa abyssinica* is eaten for some days.
Rumex abyssinicus Jacq.	Polygonaceae	Makmako(A) Dhangaggoo Fardaa(O)	H	R	Hu	"Ayne tila"	Root of *Rumex abyssinicus* and root o *Verbascum sinaiticum* are crushed together and mixed with honey. Then drunk before breakfas for three consecutive days.
				R	Hu	Hypertension	Dried root of *Rumex abyssinicus* is pounded added to tea and drunk
				R	Hu	Ring worm	The root of *Rumex abyssinicus* with root o *Rumex nepalensis* is pounded, powdered, mixed with solution of *Citrus limon* and creamed on affected part.
Rumex nepalensis Spreng.	Polygonaceae	Lut (A)	H	R	Li	Retained placenta	Latex of *Rumex nepalensis* root is washed ou by water and given to animal (e.g. sheep, cow)

		Tultii(O)					
				R	Hu	Stomach-ache	Root is Chewed and the sap is swallowed.
				R	Hu	wound	Root is chopped, dried, powdered and applied on wounded part.
				L	Hu	Spider poison	Leaf of *Rumex nepalensis* is directly rubbed on affected skin.
				R	Hu	Internal parasite	The root is Chewed and swallowed or boiled in the water and one glass of the solution is drunk.
				R	Hu	Body swelling	Dry/fresh root is chewed and put on the swollen part.
Rumexnervosus Vahl	Polygonaceae	Embacho (A) Dhangaggoo	Sh	L	Hu	Wound	Dried root bark is crushed, pounded, mixed with butter and placed on the wound.
				R		Skin rash	Root of *Rumex nervosus* is dried and powdered. One coffee cup of powder is mixed with butter and creamed on affected skin
				L	Hu	Snake bite	The leaf of *Rumex nervosus* is chewed and the solution is swallowed during bite time.
				L/ St	Li	Lice	*Rumex nervosus* together with *Sida schimperiana* is used to wash the calf to remove external parasites and Scabies (itches).
Ruta chalepensis L.	Rutaceae	Tenadam(A) Cilaattama(O)	H	L	Hu	Stomach-ache	Fresh leaf of Ruta chalepensis mixed with sugar & powder of Vicia faba, then boiled and drunk (or chewing and taking the sap).
				B/ L	Li	Cocoidiosis (Bilii)	Bark and leaf of *Ruta chalepensis* and root of *Justica schimperiana* are pounded together and given to hen with injera.
				Se	Hu	Evil eye	The seed of *Ruta chalepensis* with *Allium sativum* are finely crushed together and sniffed at the sickness time
Salix macronata THunb.	Salicaceae	Lahaya(A) Alaltuu(O)	T	Sht	Hu	Hemorrhage	Fresh shoot is crushed, squeezed and the juice is rubbed on the affected part.
				L	Hu	Wound	Fresh leaf of *Salix macronata* is pounded and placed on wounded part

				L	Li	Joint dislocation	The leaf is ground along with young stem mixed with bread and given to the cattle i problem
Schinus molle L.	Anacardiaceae	Kundoberbere(A) Qundobarbaree(O)	T	L/Fu	Li	Eye disease	Fesh Leaf and fruit of *Schinusmolle* are chewe and spitted on cattle, equines, goat and shee eye.
				Se	Hu	Tonsillitis	Dried seed of *Schinusmolle* is pounded powdered, mixed with honey and then drunk
Sesamum indicum L.	Pedaliaceae	Selit(A) Saliixa(O)	H	Se	Hu	Ear defect	Extract oil from the seed and drop the extract i canal the ear.
Sidas chimperiana Hochst. Ex A. Rich.	Malavaceae	Cifrig(A) Harmellaa(O)	H	R	Hu	Syphilis (ketegn)	Fresh Root of *Sidaschimperiana* and root o *Solanumadoense* are crushed together an mixed with water and decanted. Then mixe with honey and drunk.
				R	Li	Horse disease	Ground, mixed with water and drunk or applie through the nostrils.
				R	Hu	Evil eye	Root is fumigated every evening to patient unti recovery.
Solanum adoense (Hochst) ex A. Rich.	Solanaceae	Zerch Enbuay(A) Hiddii baddaa(O)	Sh	Fu	Hu	Wound	Adding the drop of *Solanum adoense* fruit juic on wounded part
				Fu	Li	Bloat	Fruits of *Solanumadoense* are Squeezed o cattle feed.

				L	Li	Anthrax	Dried leaf of *Solanum adoense* is crushed pounded, mixed with tella and given to cattle.
Solanum incanum L.	Solanaceae	Enbuay(A) Hiddii loonii(O)	Sh	R	Hu	Snake bite	Dried root powder is drunk with coffee.
				Sa	Hu	Infection caused by spine in leg	The sap of fresh fruit is squeezed & dropped on affected part.
				L	Hu	Nasal bleeding	The leaf of *Solanum incanum* is ground powdered and sniffed several times until recovery.
				L	Li	Urination problem	The leaf of *Solanum incanum* and that of *Cuminum cyminum* are smashed together, mixed with water and given for horse, donkey, and mules to drink
Solanecio gigas (Vatke.)C. Jeffery	Astraceae	Yeshikoko gomen(Mogne qitel(A)) Jirma Jaldeessaa(O)	Sh	L	Li	Bloating	The leaf of *Solanecio gigas* is pounded squeezed and the juice is added through the nose
				L	Li	Lice	Leaf of *Solanecio gigas* is used to wash hair of calf as lice killer.
Stephania abyssinica (Dillo&A.Rich.)Walp.	Menispermacae	Ye ayit hareg(Chewchawit(Etse Iyesus(A) Hidda kalaalaa(O)	Cl	L	Hu	Wound	Leaf of *Stephania abyssinica* is pounded and a small amount is added to wound.
				R	Li	Rabies	Dry root of *Stephaniaabyssinica* is powdered and baked with teff flour and given to cattle.
				L	Li	Pasturolosis	Dried root and leaf of *Stephaniaabyssinica* is powdered together, mixed with water and given to the animal (cattle, goat or sheep).
Syzgium aromaticum L.	myrtaceae	Kirunfud(A) Qurunfudii (O)	T	Fu	Hu	Impotency	Dried *Syzgium aromaticum* is crushed, mixed with goat milk and boiled. Then the decoction is drunk.
				Fu	Hu	Vomit	Fruit of *Syzgiumaromaticum* with rhizome of *Zingiberofficinale* is boiled and drunk.

Tanacetum cinerariifolium (Trev). Sch. Bip.	Asteraceae	Kaba(A)	H	L	Hu	Fibril illness	The leaf of *Tanacetum cineratiifolium* i squeezed and drunk
Trigonellafoenum-Graecum L.	Fabaceae	Abish(A) Sunqoo(O)	H	Se	Hu	Leg wound	Seed of *TrigonellafoenumGraecum*, seed o *Faciafaba* and seed of *Linumusitatissimum* ar finely ground together, rolled in piece of clot and tied on leg
				Se	Hu	Body swelling	The seed of *Trigonellafoenum-graecum* i crushed, powdered, mixed with honey and littl water, then boiled like "porage" and eaten
				Se	Hu	Bone fracture	Seed is powdered; water is added to flour t make the paste, and then applied to the broke bone.
Thymus schimperi Ronniger	Lamiaceae	Tosign(A) Xassee(O)	H	Ag	Hu	Cough	Its leaves, root and bark are ground together powdered and mixed with water, one coffee cu (sini) is drunk during pain time.
				L	Hu	Stomach-ache	Leaf is boiled with leaves of *Foeniculumvulgar* and one tea cup is taken.
				L	Hu	Hypertension	Leaf is boiled with sugar and drunk.
Urera hypselodendron (A. Rich.) Wedd.	Urticaceae	Lankuso(A) Laanqisaa dhoqonu (O)	Cl	B	Li	Anthrax	Bark/shoot of *Urera hypselodendron* is crushed smashed, mixed with powder of *Trigonella* *foenum-graecum* or with egg and given to cattle
Urtica simensis Steudel	Urticaceae	Sama(A) Doobbii (O)	H	L	Hu	Gastritis, Heart Disease	Eat in the form of stew ('wot') against gastriti & heart disease.
				R/L	Hu	Gonorrhea	The root and leaves of *Urticasimensis* with th bark of *Crotonmacrostachyhus* are pounded powdered, mixed with little water ,filtered, the a cup of filtrate is drunk for 5 days in th morning
Verbena officinalis L.	Verbenaceae	Atuch(A) Derguu(O)	H	L	Hu	For tonsillitis	Leaf of *Verbenaofficinalis* is Crushed, smashed mixed with butter and creamed around neck.
				R	Hu	Fibril illness	Root of *Verbenaofficinalis*, together with th root of *Carissaspinarum* and root o

							Rutachalepensis, are fumigated to the patient.
				R	Hu	Diarrhea	Root of *V. officinalis* and root o *Phytolaccadodecandra*, bark o *Crotonmacrostachyus* are pounded, mixed wit water, decanted and drunk after a day.
Verbascum sinaiticum Benth.	Scrophulariaceae	Kutina(Ye Ahya joro(A) Gurra Harree (O)	H	R	Li	Horse disease	Fresh Root of *Verbascumsinaiticum* is collecte from three places, smashed, mixed with wate decanted and given to horse
				L	Hu	Impotency	Chopped Leaf of *Verbascum sinaiticum i* rolled by clean piece of cloth and tied aroun male sex organ to erect it.
				R	Hu	Wound	The root of *Verbascum sinaiticum* is crushed powdered, mixed with butter and creamed o affected part.
Vernonia amygdalina Del.	Asteraceae	Gerawa(A) Eebicha (O)	T	L	Hu	Malaria	Crushed leaves of *Vernonia amygdalin* concocted with leaves of *Ruta chalepensis*. On cup is served as a drink for 3-5 days with col water in the morning.
				L	Hu	Skin infection	The leaf of *Vernonia amygdalina* is pounde and the patient body is washed by the plant o the leaf of is used as a soap to wash the infecte body.
				L	Li	Bloating Urine retention	Fresh leaves is squeezed, mixed with wate and then given to cattle in morning and at nigh until recovery.
Vernonia hymenolepis A.Rich.	Asteraceae	Weynagift (A) Sooyyama(O)	Sh	L	Hu	Gonorrhea	Leaf twig of *Vernonia hymenolepis* and bark o *Croton macrostachyus* are pounded together mixed with honey and 1-3 spoons is taken in th morning before breakfast.
				L	Hu	Wound	Leaf of *Vernonia hymenolepis* is squeezed an the sap is dropped on the wound.

Zehneria scabra (Linn.f.) Sond.	Cucurbitaceae	Haregresa(Etse sabeq(Nech Hareg(A) Qorii Sinbiraa(O)	Cl	L	Hu	Swelling	Leaf and bark of *Zehneria scabra* and leaf o *Rumex nervosues* are pounded together, rolle in clean cloth, and tied on swelling.
				L	Hu	Fibril illness	The leaf of *Zehneria scabra* is pounded squeezed and mixed with sugar and drunk on cup /or the stem is boiled and inhaled.
				R	Hu	Sudden sickness	Fresh root is pounded, mixed with water an drunk.
				L	Hu	Dandruff	Fresh leaf is squeezed to make juice an creamed after hair is cut.
Ziziphus spina-christi (L.) Desf.	Rhamnaceae	Gaba(A)	Sh	L	Hu	Dandruff	The leaf of *Zizlphus spina-christi* is pounded powdered, mixed with butter and then creamed.
Zingiber officinale Roscoe	Zingiberaceae	Jinjible(A) Zinjibila(O)	H	Rh	Hu	Malaria	Rhizome of *Zingiber officinale* and bulb o *Allium sativum* are pounded together and eate with honey.
					Hu	Stomach ache	Rhizome of *Zingiber officinale* together wit Leaf of *Vernonia amygdalina* and bulb o *Allium sativum* are pounded and eaten wit honey.

Appendix 3: List of the medicinal plant families and corresponding number of genera and species in the study area

No.	Family	No. of genera	No. of plant species	No	Family	No. of genera	No. of plant species
1.	Acanthaceae	1	1	27	Menispermacae	1	1
2.	Alliaceae	1	2	28	Myrsinaceae	2	2
3.	Aloaceae	1	1	29	Myrtaceae	3	3
4.	Amaranthaceae	1	1	30	Oleaceae	2	2
5.	Anacardiaceae	1	1	31	Pedaliaceae	1	1
6.	Apiaceae	1	1	32	Phytolaccaceae	1	1
7.	Apocynaceae	1	1	33	Pittosporaceae	1	1
8.	Asparagacea	1	1	34	Plantaginaceae	1	1
9.	Asteraceae	6	7	35	Polygonaceae	1	3
10.	Boraginaceae	2	2	36	Ranunculaceae	2	2
11.	Brassicaceae	2	3	37	Rhamnaceae	2	2
12.	Cactaceae	1	1	38	Rosaceae	3	3
13.	Caricaceae	1	1	39	Rubiaceae	1	1
14.	Cucurbitaceae	3	3	40	Rutaceae	2	2
15.	Cupressaceae	2	2	41	Salicaceae	1	1
16.	Ericaceae	1	1	42	Santalaceae	1	1
17.	Euphorbiaceae	5	5	43	Sapindaceae	1	1
18.	Fabaceae	4	4	44	Scrophulariaceae	1	1
19.	Flacourtiaceae	1	1	45	Simaroubaceae	1	1
20.	Hypericaceae	1	1	46	Solanaceae	5	6
21.	Lamiaceae	4	5	47	Sterculiaceae	1	1
22.	Lineaceae	1	1	48	Urticaceae	2	2
23.	Lobeliaceae	1	1	49	Verbenaceae	1	1
24.	Loganiaceae	1	1	50	Vitaceae	1	1
25.	Malvaceae	2	2	51	Zingiberaceae	1	1
26.	Meliaceae	1	1				

Appendix 4: Major food crops grown in the study area

Categories	Scientific name	English name	Local name (Amharic)
Cereal	*Sorghum bicolor*	Sorghum	Mashila
	Zea mays	Corn	Bekelo
	Eragrostis tef	Tef	Tef
	Hordeum vulgare	Barley	Gebs
	Triticum aestivum	Wheat	Sindie
	Eleusine coracana	Finger millet	Dagussa
Pulses	*Cicer aestivum*	Chickpeas	Shinbira
	Pisum sativum	Pea	Ater
	Vicia faba	Broad Bean	Bakela
	Phaseolus vulgaris	Haricot beans	Adenguare
Root crops	*Allium cepa*	Onion	Key shenukrt
	Allium sativum	Garlic	Nech shenukrt
	Solanum tuberosum	Potato	Dinich
	Beta vulgaris	Beet root	Keysir
	Daucus carota	carrot	karot
	Ipomoea batatus	Sweet potato	Skuar dinch
	Trigonella foenum-graecum	Fenugreek	Abish
	Cuminum cyminum	White cumin	Nech Azmud
	Nigella sativa	Black Cumin	Tikur Azmud
	Coriandrum sativum	Coriander	Dinbilal
	Zingiber officinale	Zinger	Zinjibil
	Ruta chalepensis	Rue	Tenadam
	Ocimum basilicum	Basil	Bosobila

Fiber	*Gossypum barbdense*	Cotton	Tit
Vegetables	*Capsicum annuum*	Chili	Berbere
	Lycopersicon esculentum	Tomato	Timatim
	Cucurbita pepo	Pumpkin	Duba
	Brassica integrifolia	Cabbage	Tikel gomen
Fruit	*Carica papaya*	Papaya	Papaya
	Citrus limon	Lime	Lomi
	Citrus sinensis	Orange	Burtukan
	Mangifera indica	Mango	Mango
	Psidium guajava	Guava	Zeytune
	Malus sylvestris	Apple	Apple
	Musa paradisiaca	Banana	Muz
	Persea americana	Avocado	Avocado
Stimulants	*Catha edulis*	Khat	Chat
	Coffea arabica	Coffee	Buna
	Rhamnus prinoides	Hops	Gesho
Oil crops	*Linum usitatissimum*	Lin seed	Telba
	Brassica carinata	Kale seed	Gomenzer
	Carthamus tinctorius	Sun Flower	suf
	Sesamum indicum	Sesame	selit

Source: DDARDO (2014/15)

Appendix 5: List of human diseases in the study area

No	Disease treated	Total of plant species used	Total percentage (%)
1.	Wound	25	26.88
2.	Malaria	14	15.05
3.	Stomach-ache	14	15.05
4.	Body swelling andEvil eye	10	10.75
5.	Tonsillitis	9	9.68
6.	Fibril illness, Scabies(itches) and Skin rash	7	7.52
7.	Cough,dandruff, diarrhea and headache	6	6.45
8.	Eye disease ,gonorrhea ,intestinal parasites and tape worm	5	5.38
9.	Snake bite	4	4.30
10.	Amoeba,bone fracture, fire burn, hypertension, impotency, rabies,skin cut, sudden sickness andtoothache	3	3.22
11.	Asthma, cancer ,heart disease, hemorrhoids ,nasal bleeding, pneumonia, ring worms ,urination problem and vomit	2	2.15
12.	Abortion(To stop pregnancy),back pain, bilharzia, ear defect, goiter,infertility, retained placenta and syphilis	1	1.07

Appendix 6: List of livestock diseases in the study area

No.	Disease treated	Local name(Amharic)	No. of plant species used	Percent (%)
1	Bloating	Yehode menifat	10	10.75
2	Anthrax and Leech	AbasangaAlekit	6	6.45
4	Ectoparasite (lice)	Ye wech tegegna	5	5.38
5	Rabies	Yewusha beshita	3	3.22
6	Erythroblasts, horse disease, retained placenta , cocoidiosis	Machangaf ,ye feres beshita,yengdelej sizegey and yedero beshita	2	2.15
7	Blackleg ,horse itch,pasturolosis and eye disease	Abagorba, Epizootic lymphagities,Gororsa, Aynebesheta	1	1.07

Appendix 7: Some of the cultivated and wild grown medicinal plants widely traded in the market for different uses in addition to medicinal values in Debark town

No	**Scientific Name of the medicinal plant**	**Local name**	**Used for**
1.	*Allium cepa*	Qey shenkurt	Spice, food
2.	*Allium sativum*	Nech shinkurt	Spice,food
3.	*Artemisia abyssinica*	Harit	spice
4.	*Brassica carinata*	Gomenzer	food
5.	*Brassica nigra*	Senafich	food
6.	*Capsicum annuum*	Berbere	food
7.	*Carica papaya*	Papaya	food
8.	*Citrus limon*	Lomi	Food,
9.	*Coffea Arabica*	Buna	stimulant
10.	*Cordia africana*	Wanza	Timber,live fence, fire wood
11.	*Coriandrum sativum*	Denbelal	Food
12.	*Croton macrostchyus*	Bisana	Fire wood,
13.	*Cucurbita pepo*	Duba	Food
14.	*Echinops kebericho*	Kerebicho	Smell
15.	*Eucalyptus globulus*	Nech bahirzaf	Construction,fire wood, live fence
16.	*Guizotia abyssinica*	Nug	Food

17.	*Linum usitatissimum*	Telba	Food
18.	*Lepidium sativum*	Feto	Food
19.	*Nigella sativa*	Tikur azmud	Food
20.	*Ocimum basilicum*	Zikakibe	Spice
21.	*Olea europaea L. subsp. cuspidata*	Weyra	Fire wood,consruction, farming tool
22.	*Otostegia integrifolia*	Tunjit	Fumigate
23.	*Prunus persica*	Kok	Food
24.	*Rhamnus prinoides*	Gesho	Bevarage
25.	*Ruta chalepensis*	Tenadam	Spice
26.	*Schinus molle*	Kundoberbere	Spice
27.	*Sesamum indicum*	Seli	Food
28.	*Trigonella foenum-Graecum*	Abish	Food
29.	*Thymus schimperi*	Tosign	Stimulant
30.	*Zingiber officinale*	Jinjible	Spice

Appendix 8: Checklist of Semi-structured Interview Question for Collecting Ethnobotanical data for medicinal plants.

Part I. General information

1.Name ofthe respondent_____sex_____Date of interview_____Kebele_____occupation_____age_____Religion_____marital status_____Ethnicity_____educationallevel_____ Expertise/informant type: healer_____ general informant_____

2. For how long have you lived in the area? A /since birth B/for the last 20 years C/ for the last 10 years D/ for less than 10 years

3. Other information.....

Part II. Ethnobotanical Data

4. List traditional way of classifying vegetation, soil types and landscapes in your area?

A. Vegetation----------B. Soil types ----------C. Landscapes----------

5. What are the main human health problems in the study area or Kebele?

6. What are the main livestock health problems or diseases?

7. What are the symptoms of these diseases that you know so far?

8. Do the people in the kebele use plants to treat disease in that area? If yes,

A/ local name of the traditional plants----------

B/Disease treated by the plant----------

C/ Where do the medicinal plants grow? (From where you get? In the wild, in home gardens, both in the wild and home gardens

D/ What is the habit of the plant? Tree, shrubs, Herb, Grass, climber, Liana

E/ Which part of the plant is used as remedy? (Leaf, stem, root, flower, bark, fruit, seed, latex, or whole plant)

F/Method of preparation of the medicine?(Crushed and pounded, powdered, concoction, decoction, infusion, used alone or mixed with others)

G/ Is there difference in dosage among age? If yes, state for each?

H/ How is it taken (Route of administration? Oral, Nasal, Dermal)?

I/Is there any side effect of the medicine? If yes, is there any antidote for the side effect?

J/ Do you mix some other ingredients such as water, soup, milk, or sugar etc. with the medicine? If so why? /What is/ are their roles?

K/ Is the plant marketable?

L/Are the medicinal plants easily accessible? If not why?

M/ Other uses of the plant……..

8. Condition of medicinal plants: In Fresh ……., Dried….. Powdered……..

9. Are the members of the community frequently use the traditional medicinal plant as

compared to modern medicine? Why?

10. Are there restrictions /taboos in collecting and utilizing of medicinal plants in the locality?(Method of collection, time of collection, sex, age, storage, etc.)

11. Is there any interfere of modernizations with traditional medicine application and use?

If yes how does the modernization interfere with traditional medicinal system?

12. Which group of the community use the traditional medicines most and why?

13. Which season is preferred for collection of medicinal plants in your area?

Wet season----------, Dry season----------, All-the-year round ----------

14. What are threatening factors of medicinal plants in your area? For medicinal ----------

Food---------- Firewood---------- Charcoal---------- Fence----------, Construction----------

Furniture---------- Edible fruit----------

15. How do the local people manage and conserve these medicinal plant species through their traditional indigenous knowledge?

16. How does government interfere in conserving and managing traditional medicinal plants?

Appendix 9: List of the informants contacted/consulted during the ethnobothanical study

S.No	Name	Sex	Age	Kebele	Educational status	Occupation
1.	Abajew Terefe	M	22	Miqara	12^{th}	Student
2.	Abebaw Getahun*	M	56	Debir	Educated	Farmer
3.	Abebe Ermias*	M	25	Arba Tensa	>12	Student
4.	Addis Tegaw	F	49	Kirarina Wogemba	Illiterate	House wife
5.	Adey yitbarek	F	44	Debir	Illiterate	House wife
6.	Alebachew Mola	M	41	02	>12	Officer
7.	Alemayehu Firde*	M	62	Kirarina Wogemba	Illiterate	Farmer
8.	Alganesh Wandimeneh	F	45	Kino1	Illiterate	House wife
9.	Andualem Zarihun	M	49	Debir	6	Farmer
10.	Angaw Aweke	M	35	Kirarina Wogemba	Educated	Farmer
11.	Asegedech Abera	F	42	Miqara	Illiterate	House wife
12.	Ashebir Kumilachew*	M	56	Dibbahir	6	Farmer
13.	Ayalew Sisay*	M	74	Debir	Illiterate	Farmer
14.	Azmeraw Bezu*	M	56	Kino1	Educated	Farmer
15.	Bereket yeba	M	58	Arba Tensa	Illiterate	Farmer
16.	Betelehem Asefa	F	36	02	10^{+3}	Teacher
17.	Daniel Tessema*	M	43	02	4	Farmer
18.	Dasita Alemu*	M	61	Zebena	Illiterate	Farmer
19.	Demeke Getachew*	M	51	Zebena	Educated	Farmer
20.	Engida Asefa	M	46	Dib Bahir	Illiterate	Farmer
21.	Eshetu Dessalegn	M	60	Arba Tensa	Illiterate	Farmer
22.	Etenesh kinfu	F	23	Zebena	>10	Merchant
23.	Fatuma Mohamed	F	38	03	Educated	Merchant
24.	Genet Assefa	F	42	03	Illiterate	Merchant
25.	Hailu Getaneh	M	43	01	10	Merchant
26.	Halima mohamed	F	47	02	10	Merchant
27.	Kalemawork Abebe*	M	34	03	4^{th}	Marigeta
28.	Kasahun Adisu	M	26	Kino1	>12	Teacher
29.	Kebede Asefa	M	23	01	10	Student
30.	Kindu wondasen	M	50	Zebena	Educated	Farmer
31.	Mabratu Tamiru*	M	43	03	8	Guard
32.	Makiya mohamed	F	55	02	Illiterate	Merchant
33.	Makiya Abdu	F	35	01	8	Merchant
34.	Meaza Tefari*	M	42	03	>12	Herbalist
35.	Melaku Getahun*	M	52	Kirarina Wogamba	8	Farmer
36.	Mengistu Hilu	M	37	Debir	4	Farmer
37.	Mezgebu Taye*	M	48	Arba Tensa	5	Farmer

38.	Mitiku Wale	M	32	Dibbahir	Illiterate	Farmer
39.	Mulu Lemma	M	31	Kirarina Wogemba	4	Farmer
40.	Mulugeta Mare*	M	42	Dibbahir	6	Farmer
41.	Sebsibe Terefe	M	52	Zebena	4	Farmer
42.	Semagn Alemu	F	28	Miqara	10	Merchant
43.	Setegn Desalegn	M	44	Miqara	Educated	Farmer
44.	Shegaw Asfaw	M	32	Miqara	10	Driver
45.	Solomon Gebre	M	23	Kino1	7^{th}	Student
46.	Tadese Bezabih*	M	55	01	5	Farmer
47.	Tafese Mesfine	M	31	02	>12	Teacher
48.	Tariku Tsegaye	M	28	01	10^{+3}	DA
49.	Tedese beza	M	55	Zebena	3	Farmer
50.	Tefera Belaye*	M	22	01	4	Guard
51.	Tigabu Zinabu*	M	48	Kino1	5	Farmer
52.	Tigist Tilahun	F	29	Arba Tensa	5	House Wife
53.	Tsega Mitiku*	M	40	Miqara	4	Farmer
54.	Worke Abraham	F	54	03	Illiterate	Merchant
55.	Worku Birhanu*	M	54	Miqara	8	Farmer
56.	Yared Aregaw	M	25	Dib Bahir	10^{+3}	DA
57.	Yasriba Amadin*	F	60	02	Illiterate	Merchant
58.	Yazew Tesema	M	60	Debir	Illiterate	Farmer
59.	YeshiZinabu	F	45	Kino1	Illiterate	House wife
60.	Zawditu Asen*	F	65	01	Illiterate	Merchant
61.	Zebene Addisu	M	47	Kirarina Wogamba	Educated	Farmer
62.	Zerihun Endale	M	34	Dib Bahir	4	Farmer

Key: With * are key informants

DECLARATION

I, the undersigned, declare that this thesis is my original work and has not been presented for a degree in any other universities for the same purpose. All sources of materials used for the thesis have been correctly acknowledged.

Asmera Amde _____ _____

(Signature) (Date)

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